World Vision

Risky Development

Export Concentration, Foreign Investment and Policy Conditionality

Brett Parris

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by Brett Parris

September 2003

Cover design: Andrew Clarke

First Published September, 2003

This report is produced by World Vision Australia on behalf of the World Vision partnership and is distributed by the International Advocacy Office of World Vision International.

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All references to dollars ($) are to US dollars unless otherwise stated.
One billion means 1000 million.

ISBN 1-875140-60-3

Contents

Acknowledgements

Several people deserve my thanks for their invaluable assistance during the preparation of this report.

Within the World Vision partnership Jon Chamberlain, Kel Currah, João Diniz, Haidy Ear-Dupuy, Heather Elliot, Patricia Forner, Tom Getman, Melanie Gow, Kevin Gray, Diane Halasz, Joe Muwonge, Gigi Newman, Linda Ng-Tatam, Kirsty Nowlan, Eduardo Nunes, Matt Scott, Christopher Shore, Kathy Vandergrift, Bill Walker and Alan Whaites provided helpful comments, enlightening discussions or other support at various times. I also greatly appreciated the assistance and patience of Michelle Webb and Katie Chalk in World Vision Australia's publications team.

I have been fortunate to have had good teachers and in this regard I am grateful to Brett Inder, Mark Harris, John Stapleton, Robert Rice, Dietrich Fausten, Christis Tombazos, Pushkar Maitra, Peter Forsyth, Alan Powell, John Madden, Mike White and Xiaokai Yang at Monash University for helping me to explore a fascinating field. They will not agree with everything here of course, and my errors should not reflect on them. Brett Inder in particular graciously suffered long periods of questioning at odd times and has been inspirational as a teacher and researcher.

I would also like to thank the OECD for permission to substantially reprint Chapter 6 on foreign investment, most of which was originally presented at the conference: New Horizons and Policy Challenges for Foreign Direct Investment in the 21st Century, organised by the OECD and the Government of Mexico, 26-27 November 2001 in Mexico City and published in *New Horizons in Foreign Direct Investment*, OECD, Paris, March 2002.

My wife Julie and daughter Jessica endured many hours of my being locked away in my 'cave'. I appreciate their continued love and support.

Finally, I would be grateful to any readers who are able take the time to point out some of the report's inevitable shortcomings, errors or ways it could be improved in any future editions. Please write to me at: parrisb@wva.org.au

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September, 2003

Executive Summary

1. Introduction

For the last 25 years, developing countries have increasingly been pressured and cajoled into liberalising their trade regimes. The dominant neo-liberal theory says that they will be better off if they liberalise and specialise their production and exports in their areas of current comparative advantage. But that is not how today's industrialised countries developed, nor, more recently, how Korea and Taiwan achieved their remarkable industrial transformations and drastic reductions in poverty.

It is readily acknowledged that there are costs to trade restrictions. But are there also costs and risks associated with premature liberalisation and specialisation? Investors are advised to diversify: "Don't put all your eggs in one basket". Could the same advice also apply to trade specialisation? Does too great a concentration in the export sector - specialising and relying on too few products - also bring its own costs? If so, then the question of appropriate trade and industrial policies remains open, and it becomes a matter of carefully weighing the long-term costs, benefits and risks of alternative strategies. There are significant dangers then for developing countries in having their policy options foreclosed by IMF and World Bank loan conditionalities and by inappropriately restrictive WTO rules.

2. Theoretical and Methodological Controversies

At the core of many of the controversies over trade and industrial policy is a methodological dispute over the appropriate analytical framework. The dispute is not always articulated, but it is the source of many of the conflicting views on the issues discussed in this report and it has serious implications for the policy advice developing countries are given, and the policy freedom they are permitted by institutions such as the World Bank, IMF and WTO.

Formal mathematical models are crucial for economic analysis but current formal models are not able to capture the pervasiveness of market failures caused by incomplete markets and externalities in developing countries. They are also unable to deal adequately with imperfect information, the richness of potential interactions between firms and governments and the dynamic interactions between growth, learning, innovation and poverty reduction. Another approach, in the institutionalist and evolutionary traditions, has been termed 'appreciative' theorising and seeks to overcome these problems by undertaking detailed case studies. This report therefore uses a mix of formal theory, econometrics and appreciative theory to explore the question of whether a country's degree of export concentration and the types of products it exports matters for its development - and if so, how much.

3. Exports, Growth and Poverty

Using data from 84 developing countries from the period 1981 to 2000, the links between export concentration, the types of products exported, terms of trade volatility, growth and poverty are examined. The results lend support to the argument that while there are certainly costs and risks associated with seeking to diversify a country's economic base through an active industrial policy, there are also costs and risks associated with specialisation and concentration.

It is found that export concentration is robustly associated with increased terms of trade volatility, increased volatility of the purchasing power of exports, higher levels of infant mortality, lower levels of immunisation against measles and diphtheria, pertussis (whooping cough) and tetanus (DPT), lower female life expectancy and higher levels of female illiteracy among both youths and adults. Increased terms of trade volatility is itself associated with lower GDP per capita growth, higher

levels of female adult and youth illiteracy and lower levels of immunisation against measles and DPT. Higher levels of export purchasing power volatility are associated with lower levels of immunisation against measles and DPT and higher levels of female illiteracy in both youths and adults. It also matters what countries export. Higher proportions of agricultural raw materials exports are associated with higher GDP per capita growth but worse levels of female life expectancy, and malnutrition in under-fives (by height for age). Conversely, higher proportions of manufactures exports generally have beneficial associations - lower terms of trade volatility, lower purchasing power of exports volatility, higher GDP per capita growth, higher immunisation rates against measles and higher female life expectancy.

These results imply that deliberate and carefully managed diversification strategies are a strategy worth considering. But do such strategies have a sound theoretical basis and can they be successful?

4. Static and Dynamic Comparative Advantage

Developing countries are generally urged to specialise according to their current comparative advantage - to export more of what they are good at and let others produce what they are currently relatively less good at. This is good advice for maximising static resource allocations. But following such advice will not necessarily maximise a country's long-run growth and development potential.

One of the open secrets of economics is that comparative advantage should not be thought of primarily in static terms. It can be altered and comparative advantage in new fields can be acquired with the judicious use of interventions. The importance of the issue lies not only in its historical interest, but in the fact that a number of current and proposed rules under the WTO severely curtail the use of the kinds of interventions that have been shown to work successfully in the past.

5. Case Study: Trade and Industrial Policy in Korea

Korea is instructive as a case study because of the way it transformed itself in 50 years from one of the poorest countries in Asia into an industrial powerhouse and member of the OECD, severely reducing poverty in the process. Government intervention was sophisticated and extensive, carefully balancing policies supporting business such as limited protection and subsidised credit, with policies disciplining business such as export targets. Not all the details of the Korean strategy are replicable - countries start from very different bases in terms of their institutions, infrastructure and human capital. Nevertheless, Korea's experience shows what can be done with competent institutions, a good human capital base and a flexible policy framework.

6. Foreign Investment

As one of the so-called 'Singapore Issues', foreign direct investment (FDI) has been an acrimonious subject of debate in the WTO - and rightly so. In an era of inadequate aid funding and a glacial pace for debt relief, (which even then is inadequate), FDI offers significant scope for channelling much-needed resources to some developing countries. But FDI is highly concentrated geographically and most developing countries still require greatly increased aid flows to alleviate poverty, to build infrastructure and to develop sound institutions.

More fundamentally, FDI has costs as well as benefits. It is not always a net benefit to the host country and whether it is a net benefit, depends not just on the quality and integrity of the company concerned, but on the local economic structure. Some studies have shown that up to a third of projects can be a net cost to the host country. Major FDI proposals should therefore be evaluated carefully in a comprehensive cost-benefit framework. Cost-benefit analysis is a much-neglected, but essential skill and most developing countries require increased technical assistance and resources to build their capacities to undertake it. Neglecting sound cost-benefit analysis of FDI is a dangerous false economy.

Some argue that corporate codes of conduct can ensure that FDI will be beneficial. But these codes vary enormously in their usefulness, depending on what they include, what they leave out and what procedures are in place for monitoring and enforcing them. Many fail on all counts. The better ones can be useful as an adjunct to a sound legal environment, or as a restraint in more chaotic circumstances, but they must not 'crowd out' the development of sound, well-enforced social, environmental, tax, anti-corruption and labour laws. Moreover, a company's adherence to an outstanding code of conduct does not automatically mean that its FDI will be beneficial to the host country. FDI by the perfect company in the wrong sector or in the wrong economic circumstances can still result in a net cost to the host country over time. Thorough cost-benefit analyses of proposed FDI projects remain essential.

Moves to begin negotiations on investment in the WTO are premature and any proposals that would limit developing countries' policy options in regulating FDI are inappropriate.

7. Trade, Diversification and the Role of Aid

Human capital, infrastructure and institutions play a vital role in export diversification, investment management and poverty reduction. For poor countries dependent on a narrow range of commodities, export diversification, investment and technological improvement are needed to fuel economic growth and reduce poverty. However, these drivers of growth themselves rely on capable and well-functioning institutions, a good human capital base and decent infrastructure. In many of the poorest countries, these institutions are either dysfunctional or non-existent, the human capital base is poor and the infrastructure sadly deficient. Aid has a vital role in creating or strengthening all three of these vital capabilities and developing countries need vastly more assistance than they are currently receiving.

An ideology advocating "trade not aid" underlies both the push for blanket liberalisation in the WTO and the cuts to many OECD countries' aid budgets over the last 25 years. But this ideological slogan rests on a vacuous, misleading dichotomy that has more to do with fiscal and political expediency and economic vested interests in OECD countries than sound development principles.

Trade is essential for developing countries and the developed countries must take seriously their need to provide greater market access for developing country goods and services. But trade is only one side of the coin. More aid is also essential in order to help poorer countries to build the infrastructure, strengthen the institutions and nurture the human capital bases they need to be able to reduce poverty and participate equitably in the international trading system. Without much greater assistance, and without developed countries eliminating their own export subsidies and granting substantially greater market access for developing country goods and services, any description of the WTO negotiations as a 'development round' will remain pure rhetoric - and the world will be the poorer for it.

Donors and lenders should also pay particular attention to the needs of children. Every generation of children allowed to grow up malnourished, poorly educated and traumatised by violence puts their country further and further behind. No amount of economic tinkering later on can make up for those lost years.

1. Introduction

Despite innumerable conferences, declarations, projects and initiatives over the last fifty years, poverty remains a daily nightmare for hundreds of millions of people and it is arguably the greatest challenge facing the international community. In the period 1995 to 1999, 80% of people in the 49 Least Developed Countries (LDCs), were still living on less than $2 a day, with average consumption of just $1.03 a day (UNCTAD, 2000c).

As the popular backlash against globalisation grows, there is no more important prerequisite for the survival and prosperity of the international trading system than that of sharply reducing poverty. Not only is poverty a crushing burden for the majority of the world's countries, it is a tragic waste of human potential, a leading cause of environmental degradation and fuel for the fires of discontent and political instability.

Trade has an important role to play in reducing poverty and a rules-based system - even a flawed one such as the WTO - is essential to provide weaker countries with any hope of redress against the arbitrary actions of more powerful nations. But a rules-based system brings its own dangers. One of the most insidious of these is the gradual erosion of policy options available to poorer countries to strengthen and diversify their economic bases. The big three economic multilateral institutions, the WTO, World Bank and IMF have a stated goal of greater policy coherence or 'harmonisation' between them, and the danger of reduced policy options for developing countries is growing. The mission creep of the WTO into intellectual property during the Uruguay Round and potentially investment, competition policy and government procurement, underscores the dangers.

Development donors and lenders have for three decades attached a range of trade policy conditions to their loans and grants. These conditions are remarkable for their divergence from the actual trade policies pursued both by most donor countries during their own development and also from the path pursued by more recent successful Asian states - particularly the Republic of Korea and Taiwan.[1] The insistence that developing countries should liberalise and specialise according to their current comparative advantage, no matter what stage they are up to and no matter what the state of their institutions, flies in the face of both economic theory and development history.

The World Bank and IMF exert considerable pressure on developing countries, but they have little ability to exert the same pressure on rich country governments to liberalise their own markets, particularly for goods vital to developing countries such as agricultural products, textiles, clothing and footwear. This is hardly surprising since the voting weights in the World Bank and IMF depend on a country's contributions. So the richer you are, the more influence you have - as the world witnessed during the political machinations leading to Joseph Stiglitz's precipitous departure from his role of Chief Economist of the World Bank in 2000. The unbalanced use of power and influence over developing but not developed countries is transparently unjust.

This report examines some central components of economic policy conditionality, including the misplaced emphasis on static notions of comparative advantage and the excessive priority that is attached to attracting foreign direct investment (FDI). While FDI can certainly be beneficial, it is not without its own costs and risks. The extensive links between trade and aid are also a major theme. Aid is no substitute for sound and equitable economic policies, but it can be a vital catalyst. Aid has a unique role to play in accelerating the process of strengthening institutions, improving infrastructure and preventing human wastage on a colossal scale by ensuring that children are well nourished, healthy and educated. Before discussing these issues in detail, it is useful to explore some of the roots of the controversies in the next chapter.

[1] The Republic of Korea, (South Korea) will from here simply be referred to as Korea.

2. Theoretical and Methodological Controversies

2.1 Modelling Trade, Growth and Development

In the eyes of most of the economics profession, formal mathematical modelling occupies the place of honour in the hierarchy of economic methodologies. For many observers of the profession and consumers of its output, this is something of an irritant, making a great deal of the analysis simply impenetrable. But Paul Krugman (1997, p. 79) is right to emphasise the importance of formal models in economic analysis, since "we all think in simplified models, all the time". In other words, because none of us have unmediated access to 'the truth', all our systematic thought takes place in terms of metaphors and models. Explicit models, and yes, explicit mathematical models, are essential to be able to rigorously explore the assumptions underlying an argument and the logical chain of reasoning from those assumptions to a conclusion.

The use of mathematics in economics is therefore an essential tool rather than a problem. I say this with two important caveats. First, such mathematical formalism can become an end in itself - an end which economist Deirdre McCloskey (2000, p. 233-237) has disparagingly but aptly described as "boys' games in a sandbox" - fun if you like that sort of thing, but irrelevant to the real world. More seriously, mathematics can become a danger when its role shifts from that of a useful language in which to express ideas, to that of a standard by which ideas are judged worthy of consideration.

The increasing reliance on mathematics has arguably become a constraint, limiting the acceptable discussion of 'proper' analysis primarily to those ideas which can be expressed in the mathematics of the day. Many economists are strongly biased against ideas and insights which are difficult or inherently impossible to formalise mathematically. According to Krugman (1994a) early discursive 'political economy' theories such as those of John Stuart Mill, Adam Smith, Friedrich List and some of the 1950s development economists, became marginalised from mainstream economics with its increasing formalisation and greater use of mathematics - in part because their ideas were too complex to model formally with the tools then available.

The difficulty of formally modelling complex ideas and dynamic interactions is one of the main reasons that the study of the links between technological change, industrial development, trade and economic growth in developing countries is so fraught with conflicting economic theories and methodologies. While many writers in the formal neoclassical tradition of growth theory (eg. Solow, 1956; Swan, 1956) and more recently endogenous growth theory (eg. Lucas, 1988; Romer, 1986, 1987, 1990, 1994; Aghion and Howitt, 1992, 1998) deal with technical change (even if only as a 'residual'), others in the institutional and evolutionary traditions (eg. Nelson & Winter, 1982; Nelson, various years, Dosi, 1988) have long regarded the neoclassical approach as inadequate.

Nelson (1994), following Nelson and Winter (1982), makes a useful distinction between *formal* and *appreciative* economic theory. Formal theory emphasises formal models and rigorous logical chains from abstract assumptions to theoretical conclusions. Appreciative theory is more empirically focused, discursive and exploratative. These are not watertight compartments obviously, and both methodologies have an appropriate role to play in economics, but Nelson is right in arguing that neoclassical formalism lags significantly behind appreciative theory in its understanding of growth and technological change. Nelson (1997, 1998) notes that many of the ideas in the 'new' growth theory have been around since the 1950s (eg. Abramovitz, 1952, 1956; Hirschman, 1958) and current models are still unable to capture adequately the richness of firm-level dynamic learning and innovation and the complex micro-interactions between firms and governments.

The gap between the formal models and the appreciative approach matters, because it is precisely the technological progress of firms that is one of the key drivers of economic growth, industrial

diversification and the acquisition of comparative advantage in new areas. The blind-spot which most neoclassical models have with respect to dynamic technological change and economic growth makes them inadequate by themselves to deal with industrial policy (Stewart, 1985). As Amsden (1993) argues, trade policies should be built on a foundation of explicit, detailed, micro-level studies of firm-government interaction and the processes governing the growth of firms and technology acquisition. The effects of uncertainty on investment decisions are also critical (Dixit and Pindyck, 1994). Such studies are essential for identifying the 'hidden', indirect and hard to identify subsidies, which regularly lead to underestimates of government support. Sadly however, as Amsden later observed:

> [T]he elite of development economists at present neglects production almost entirely in analyzing the state's role in industrial development. … Microeconomic questions about how firms are formed, how technologies are acquired, how industries emerge, develop, or die, and what roles governments play in the process occupy an infinitesimally small place compared with macroeconomic questions about fiscal prudence and foreign trade (Amsden, 1997, p. 469).

To argue that current formal models are inadequate in this particular area is not to downplay the role of tractable models in economic analysis, which by necessity must use simplifying assumptions. Such models can be powerful analytical tools illuminating core issues. Again, explicit models are essential, but it is still entirely possible for a model to be *too* simple and therefore inappropriate for policy purposes in a particular context.

For example, the rigorous development of trade theory began with assuming perfect competition and constant returns to scale and progressed to modern models of imperfect competition, increasing returns to scale, and dynamic learning effects. Before the techniques were developed to deal with imperfect competition, models of perfect competition were the only game in town. But that did not necessarily make them appropriate for real-world cases where imperfect competition was endemic. Similarly, Tyers (1991) severely criticised the use of simple comparative static partial equilibrium models during the Uruguay Round trade negotiations on agriculture. He argued that ignoring dynamic behaviour, risk and uncertainty made the models fatally unreliable.

Models are not reality, and the usefulness of a model for policy purposes depends crucially on the appropriateness of its assumptions for a given context, and above all the sensitivity to these assumptions of the specific policy recommendations flowing from the models. Sound country-specific policy advice must rely on decent data, good econometrics and a model appropriate for the local circumstances. It may be helpful then to list in Box 1 some of the assumptions that commonly underlie neoclassical trade and growth models. Most formal neoclassical models rely on the great majority of these assumptions, either explicitly or implicitly. Models focussing on a particular policy dimension may relax certain assumptions, about perfect competition or constant returns to scale for trade models, or freely adjusting wages for labour-market models. But while relaxing the assumptions of interest, the whole suite of other assumptions tends to be retained.

Computable General Equilibrium (CGE) models can address some of these issues but to remain tractable they too must rely on most of the assumptions in Box 1. Even then, they are often comparative static models, such as the GTAP global trade model (Hertel, 1997) rather than true dynamic models, which significantly reduces their usefulness for analysing growth and transition dynamics. There are exceptions of course, such as the dynamic MONASH model of Australia (Dixon and Rimmer, 2003). There has also been encouraging progress in addressing the implications for poverty of various trade policy options in a CGE framework (eg. by Hertel *et al.* 2003, Decaluwé *et al.* 1999, Cogneau and Robilliard 2000, Evans 2001) but such models are not yet able to capture the detailed dynamics of firm-government interaction, technological deepening and development that might help resolve questions of appropriate trade and industrial policies.[2]

[2] Using CGE models to assess structural adjustment on the poor in Africa, Sahn *et al.* (1996) ignited spirited objections from De Maio *et al.* (1999) including that the conclusions were highly dependent on the assumptions made about parameters, relationships and closure in the models. See Sahn et al (1999) for the response.

Box 1: Common assumptions underlying economic models

- Perfect competition
- Constant returns to scale (i.e. doubling a firm's inputs leads always and only to a doubling of outputs)
- Perfect information for economic actors (i.e. there is no uncertainty and therefore no risk)
- No information, search, assimilation or computation costs
- Unlimited computational capacity of agents
- Purely rational optimising agents - no 'bounded rationality' or irrationality[3]
- No transaction costs
- No learning costs
- No barriers to entry to new firms
- Perfect, complete, capital markets
- Irrelevance of capital ownership - whether by domestic or foreign investors
- Perfect, complete, risk and insurance markets
- Perfect, complete, labour markets with no involuntary unemployment
- Unlimited availability of different types of labour - especially skilled labour and entrepreneurs
- Costless redeployment and retraining of labour across sectors (labour from a declining sector such as subsistence agriculture is costlessly redeployed to a booming sector such as software engineering)
- Prices reflect true economic, ecological and social resource costs and benefits (and therefore there are no externalities and so market prices equal shadow prices - for labour, capital, foreign exchange, government revenue).
- Prices freely adjust according to supply and demand - they are not 'sticky'
- Irrelevance of distributional issues ("a dollar is a dollar") - therefore Pareto optimality is the policy yardstick. Changes are only made if someone can be made better off without making anyone else worse off.
- Perfect and costless enforcement of contracts and property rights
- No hysteresis or path dependency (eg. bankrupted firms are costlessly resurrected after a recession; the unemployed do not lose their skills while out of work etc.)
- No difference between the private and social rates of return or discount rates
- Knowledge and technology for firms are freely available as 'blueprints' which can be easily and costlessly absorbed, so that all firms lie on the production possibility frontier. There is no 'tacit' knowledge.
- A smooth continuum of substitution possibilities between capital and labour on a production possibility frontier. Production inputs are not 'lumpy'
- No fallacy of composition - the whole is no different from the sum of the parts (eg. If a country exports more coffee it will be better off. The possibility that 30 other countries are doing the same thing, pushing down prices, is ignored.)
- Irrelevance of money - eg. trade models are usually barter models with money ignored[4]
- Government spending ('consumption') is a cost no matter what its purpose - therefore spending on education, health, infrastructure and research is considered consumption expenditure to be minimised, not investments in physical, human and knowledge capital to be maximised.
- Irrelevance of regional geographic considerations - no distinction is made between an evenly spread welfare gain and a net welfare gain by one region within a country at the expense of another.[5]
- Irrelevance of ethnic divisions - no distinction is made between an evenly spread welfare gain and a net welfare gain by one ethnic group at the expense of another.
- All transactions are voluntary and by definition make each party better off.
- Co-ordination failures do not exist.[6]
- Revenue losses from 'distortionary' tariffs are not compensated for in welfare comparisons of pre- and post- trade liberalisation scenarios - or revenues are replaced by an artificial 'lump sum' non-distortionary tax which is not feasible in the real world.[7]

[3] See Rubinstein (1998) and Conlisk (1996).
[4] See Dillard's (1988) Presidential Address to the Eastern Economic Association for a critique of this approach.
[5] Some computable general equilibrium (CGE) models are specifically designed to capture such effects though, such as the Monash Multi-Regional Forecasting (MMRF) model of Australia.
[6] See Murphy, Shleifer and Vishny (1989) and Rodrik (1996).
[7] See Khattry and Rao (2002) for a discussion of this often neglected issue.

The simplifying assumptions underlying economic models, particularly policy-oriented CGE models, are by no means necessarily fatal problems. How 'good' a model is, depends entirely on the answer to the question: Good for what? Two questions are crucial for assessing a model's policy relevance in a given context:

1. *Which of the model's core explicit and implicit assumptions are violated in the local circumstances and by how much?*

2. Are the results of the model's simulation and the policy recommendations that may flow from it sufficiently sensitive to these assumptions that the model loses its policy relevance in this instance?

Models should yield insights into the workings of the real world, and they are often at their most useful when they lead to unexpected conclusions and new veins of inquiry. It is often assumed in economics however, that just because a model abstracts from the real world, that it therefore gives us some insight into its workings. The process of assumption and abstraction is usually described in terms of 'cutting through' to get to the core of the problem. But without further empirical verification, this assertion simply does not follow. How do I know I am cutting through to the 'core' and that the parts I discarded in my assumptions are unimportant? Without sound independent reasons for confidence in my assumptions (or in the minimal sensitivity of the model's results to particular assumptions), the model remains an interesting speculation - not a recipe for policy makers when people's lives are at stake.

It should not be claimed that a model tells us something important about the real world unless we have some other way of confirming its assumptions, predictions or insights *from* the real world - through empirical evidence, detailed case studies, accurate predictions, 'back-casting' to see if computable models are able to reproduce historical data, and so on. The policy recommendations flowing from a particular model are predetermined to a large extent by the assumptions built into it and so without some sort of verification process, any policy conclusions flowing from it should be treated with caution.

Economists tend to be well trained in how to build models, but not so well trained in how to rigorously verify their policy relevance for specific contexts. Models are often deployed on the *assumption* that they are relevant to a specific context with no explicit supporting justification.

The assumption of applicability is perhaps the most widely deployed, yet unstated, auxiliary assumption used in economic policy analysis. It is especially concerning in models dealing with developing countries where many of the assumptions in Box 1 are routinely violated - especially those regarding smoothly mobile labour and capital, complete, efficient markets, and perfect information. As Adelman (2001, p. 114-115) argues:

> Neoclassical development theory ignored the fact that the postulates of neoclassical economics, which are needed to ensure the efficiency of neoclassical market equilibria, are not applicable to developing countries…. But the absence of any of these characteristics implies that market equilibrium cannot be proved to be Pareto optimal and hence even statically efficient.

These issues are the subject of an ongoing debate *within* orthodox economics in top mainstream journals. They cannot be pushed aside and ignored as the concerns of a few heterodox fringe-dwellers and NGOs. A few examples will suffice to make this point.

Thirty-five years ago Radner (1968) showed that without the assumption of *infinite* computational capacity, Arrow-Debreau general equilibrium breaks down once an element of uncertainty is introduced: "The Arrow-Debreau world is strained to the limit by the problem of the choice of information. It breaks down completely in the face of limits on the ability of agents to compute optimal strategies". (p. 35).

Arthur (1989, 1990, 1994a, 1994b) emphasises the importance of positive feedbacks and increasing returns, which, while not necessarily applicable to all economic sectors, are certainly applicable to the more modern and dynamic knowledge-based industries. He also notes the importance of path dependency for technological development and economic geography - in particular, industrial agglomerations. While an initial choice of location by a single firm or small number of firms may be due to 'random' geographical factors, the growth of network externalities (the cumulative benefits of being close to other firms) can soon outweigh geographical factors, causing the agglomeration to become self-reinforcing. California's Silicon Valley is the most famous example of a widespread phenomenon which Krugman (1991) also examined. The implications for developing countries are significant insofar as the evidence suggests that particular geographical regions can permanently miss out on substantial industrial investment. The chances of missing out are related to the 'rich neighbour' effect. An East Asian country at an identical level of development to its counterpart in Africa has the advantage of richer neighbours with better trading and transportation infrastructure.

Incomplete markets and imperfect information are key causes of market failure and are fatal to the notion of a single ideal equilibrium growth path. Greenwald, Kohn and Stiglitz[8] (1990) analysed the effects of incomplete risk markets on firms and found that they led to a multitude of possible economic growth paths - not just a single equilibrium result. Elsewhere Greenwald and Stiglitz (1990) demonstrated that imperfect information in financial markets can lead to credit rationing, which in turn alters firm risk behaviour. Earlier, Greenwald and Stiglitz (1986, p. 259-260) summarised some of the consequences of dropping the assumptions of perfect information and complete markets:

> There is not a complete set of markets; information is imperfect; the commodities sold in any market are not homogeneous in all relevant respects; it is costly to ascertain differences among the items; individuals do not get paid on a piece rate basis; and there is an element of insurance (implicit or explicit) in almost all contractual arrangements, in labor, capital and product markets. In virtually all markets there are important instances of signalling and screening. Individuals must search for the commodities they wish to purchase, firms must search for the workers who they wish to hire, and workers must search for the firm for which they wish to work. We frequently arrive at a store only to find that it is out of inventory; or at other times we arrive to find a queue waiting to be served. Each of these are "small" instances, but their cumulative effects may indeed be large. We have constructed a model which shows that in all of these circumstances, Pareto improvements can be affected through government policies, such as commodity taxes.

Saint-Paul (1992), showed that in countries with incomplete capital markets, spreading risk through financial diversification is not always possible. An alternative strategy is to diversify by investing in different sectors. Citing Saint-Paul's paper, Imbs and Wacziarg (2003, p. 83) found robust evidence that countries tend to be most concentrated when they are poorest, then diversify as they develop, only to become more specialised again in the advanced stages of industrial development: "Thus in the context of incomplete markets, countries can be led to diversify for insurance purposes, and specialise again as financial markets deepen and the portfolio motive ceases to dominate comparative advantage considerations." This theme will be taken up in subsequent chapters.

Turning specifically to the issue of industrial development policies, Stiglitz (2001, p. 5) cautioned against analysis based on highly restrictive assumptions for real-world developing country contexts:

> The standard model that was used [in the past] was the competitive equilibrium model. Today, the limitations of that model are widely recognised; it provides an inadequate model for developed countries, and therefore a poor starting point for the construction of a model for developing economies. There is no single, overarching model to replace the competitive equilibrium model: the world is too complex. But there are a set of tools and perspectives (such as those that derive from models of imperfect information and incomplete markets) that can be used.

[8] Yes, the former Chief Economist of the World Bank and joint winner of the 2001 Nobel Prize in Economic Sciences.

In an earlier paper, Stiglitz (1989) noted that market failure was pervasive in poor countries, and that careful analysis was required to ascertain which market failures could be corrected by making markets work more efficiently, and which may require the government to help ameliorate them through non-market institutions. The same year, Devarajan and Rodrik (1989) showed that imperfect competition and scale economies are vital considerations for developing country trade policy.

Given these complexities, it is unsurprising that the formal modelling of economic growth and technological change appropriate for developing countries is an active and controversial area of research. While there have been some encouraging developments (eg. by Dosi *et al.* 1990, Taylor 1990 and Marsili 2001), there is still a fair way to go before the insights of appreciative theory are fully incorporated into the formal models. It may not even be possible to do so. In any case rather than pencil and paper models which provide a neat, single, analytic equilibrium solution, the future of policy modelling will most likely lie with very large, data-intensive CGE models which can incorporate imperfect information and incomplete markets in their theoretical structures to produce a range of probabilistic scenarios.

If the formal theory of technological change and growth is still developing then, do empirical studies offer an analytical short-cut by identifying the most appropriate variables and functional forms?

2.2 The Empirics of Economic Growth and Trade

Taken as a whole, the empirical results of the last decade's cross-country investigations into the causes of economic growth have been rather disappointing. Kenny and Williams (2001) reviewed the literature, concluding that "no model has proven robust to trial by repeated regression" (p. 1). Levine and Renelt (1992) for example, tested the influence of over 50 variables on economic growth using a variant of Leamer's (1983, 1985) extreme bounds analysis. They found that almost all conclusions of previous studies were fragile to small changes in the list of independent variables.[9] The only positive and robust correlation they found was that between average growth rates and the share of investment in GDP. While the share of investment in GDP was robustly correlated with the average share of trade (exports plus imports) in GDP, a large number of trade policy measures were not robustly correlated with growth when investment was also included. No fiscal indicators or other economic or political indicators were robustly correlated with growth or the investment share.

Levine and Renelt's result is partly due to the severity of their test. If they found a single regression for which the variable changed sign or became insignificant, then it was declared 'not robust'. In his delightfully titled 1997 paper, Sala-i-Martin softened the test, finding 22 out of 59 variables 'significant' in linear regression models.[10] But Kenny and Williams (2001, p. 12) observed that fully half of these variables can be considered "structural" (like latitude) and unable to be changed. The importance of such structural factors suggests that "it is quite possible that different policy mixes might be optimal in the presence of different structural constraints".

[9] The 'independent variables' are those on the right hand side of a regression equation of the form:
$Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \ldots + \beta_n X_n + \varepsilon_i$, where Y is the dependent variable (in this case growth), the Xs are the independent variables from the dataset, the βs are the coefficients on the Xs to be estimated, and ε_i are the errors.

[10] They are (with coefficient sign): Sub-Saharan African dummy (-), Latin American dummy (-), Absolute Latitude (+), Rule of Law (+), Political Rights (+), Civil Liberties (+), Number of Revolutions and Military Coups (-), War dummy (-), Fraction Confucian (+), Fraction Buddhist (+), Fraction Muslim (+), Fraction Catholic (-), Fraction Protestant (-), Real Exchange Rate Distortions (-), Standard Deviation of the Black Market Premium (-), Equipment Investment (+), Non-Equipment Investment (+), Fraction of Primary Products in Total Exports (-), Fraction of GDP in Mining (+), Number of Years an Economy Has Been Open Between 1950 and 1990 (+), Degree of Capitalism (+), Former Spanish Colonies (-).

They also argue that:

> the universal failure to produce robust, causally secure relations predicted by models might suggest a broader problem than statistical methodological weaknesses. The evidence appears to suggest that country growth experiences have been extremely heterogeneous in a way that is difficult to explain using any one model of economic growth.

Among the main problems they include (pp. 12-13): the ahistoricism of most growth models; the likely presence of vicious and virtuous cycles, including threshold effects (requiring, for example, a critical mass of human or physical capital before anything much happens); long-term path dependency; circular causation (proposed by Myrdal, 1957); and the difficulty of accounting for people's beliefs about themselves, others and the future.

Related to the attempts to model growth, a sizable literature has developed in recent years seeking to demonstrate that countries that are more open, or that liberalise their trade regimes, grow more strongly. Rodríguez and Rodrik (2000) criticised several of the most important studies, including those of Dollar (1992), Ben-David (1993), Sachs and Warner (1995) and Edwards (1998), arguing that methodological problems endemic in the studies in fact leave the question wide open. Often, the indicators of openness used were either poor measures of trade barriers, or were themselves highly correlated with other sources of bad economic performance. In a number of other cases the methods used to try to establish a link between trade policy and growth were flawed. Rodríguez and Rodrik concluded, after a detailed analysis that there remains little evidence that open trade policies - in the sense of lower tariff and non-tariff barriers to trade – are significantly associated with economic growth.

More recently, an influential study by Dollar and Kraay (2001) attempted to prove that 'globalisers' have grown more strongly than 'non-globalisers'. But Rodrik (2000, p. 1) criticised the pre-publication version of this study strongly on methodological grounds, arguing among other things that:

- The authors combine a policy measure (tariff averages) with an outcome (import/GDP) measure in selecting countries. …
- The paper uses different base years for calculating changes in tariffs and trade volumes…
- They exclude one country (Colombia) that should be in their list of "globalizers" according to all their stated criteria. …
- They include in their list 6 additional countries (out of 18) that do not fit the stated criteria.

Rodrik's concerns are worth quoting more fully:

> … The authors' criterion is that we should focus on countries that have had the largest tariff reductions and trade increases since 1980. So using the authors' own data, I have applied mechanically the following rule: Find the countries that are in the top 40 in terms of largest proportionate reduction in tariffs and largest proportionate increase in imports/GDP over the period 1980-84 to 1995-97, and select countries that make it to both lists. … This selection rule yields the following list of "globalizers": Argentina, Brazil, Colombia, Haiti, Hungary, Jamaica, Korea, Morocco, Mexico, Mauritius, Malaysia, Nepal, Philippines, Paraguay, Sierra Leone, Thailand, Uruguay. The growth experience of these countries as a group … reveals quite an undistinguished performance, and presents a very different picture from that shown in DK. Note in particular that we find the "no-tricks" set of globalizers to be growing on average at a significantly lower pace than in the 1960s and 1970s.
>
> …. [A]n alternative, and more appropriate selection rule is one that uses information only on tariffs. … Pick the ten countries with the largest proportionate cuts in tariffs since early 1980s. This rule yields the following countries: Brazil, Colombia, Haiti, Uruguay, Guinea, Bangladesh, South Africa, Chile, Kenya, Ghana. … The main difference [from the first group above] is that these countries turn out to be the ones that suffered much greater output collapses in the early 1980s …. In any case, their growth performance since then has been hardly exemplary …

> Therefore: When one performs the DK test without making arbitrary choices that bias the selection of the country samples, one gets results that provide no support to the hypothesis that "globalizers" did significantly better. (Rodrik, 2000, pp. 1-2)

Rodrik also responded to Dollar and Kraay's comments on his earlier paper with Rodríguez (2000):

> Their discussion makes it seem like our paper was about the lack of robustness of growth regressions (a la Levine and Renelt). In fact, our point in that paper was more basic and more damaging to the openness-growth literature. We argued that authors in this literature have used inappropriate indicators of trade policy, selected to systematically bias the results in favor of showing a statistically and quantitatively significant link between trade liberalization and growth. Our complaint was not about the fragility of the results - it was about the use of patently inappropriate measures and methods. (Rodrik, 2000, p. 5)

Rodríguez and Rodrik have not been alone in their concern about the use of inappropriate indicators of trade policy stance. Pritchett (1996) examined the links between various indicators used in the literature and found that they were generally uncorrelated with each other - a fact that "raises obvious questions about their reliability in capturing some common aspect of trade policy and the interpretation of the empirical evidence on economic performance" (p. 307). He concluded that "alternative objective summary measures of outward orientation produce entirely different country rankings" (p. 329).

2.3 An Eclectic Approach

This brings us to the crux of the dilemma in deciding the appropriate framework for analysing trade policies for technological change, industrial development and poverty reduction in developing countries. Formal modeling is a vital part of sound economic analysis but it appears that the current generation of formal models linking technological change, trade and long-term economic growth deployed for policy purposes in developing countries have not quite caught up with the detailed 'appreciative' analysis of the evolutionary and institutionalist schools. Indeed given the complexities introduced by incomplete markets, externalities and incomplete information, it is an open question whether they will be able to do so. Moreover, the econometric results and methodologies are themselves controversial, so an obvious potential short-cut turns out to be not so short. The insights of appreciative theorising on the complex interactions between technology, human capital, institutions, growth and poverty reduction would therefore arguably appear to be more appropriate for policy purposes than are current formal models. As Kenny & Williams (2001, p. 14) observed: "To argue that we are lost in the fog without models might be to wish the all too real fog away."

Methodologies and policy prescriptions that rely on *overly* simplistic models that ignore history, incomplete markets, imperfect information, institutions, firm-level dynamic learning effects, household and gender inequalities, and the long-term economic and social consequences of child poverty are not terribly useful for real world policy challenges in developing countries. This report will therefore use an eclectic mix of econometrics and an 'appreciative' theoretical approach, augmented by reference to formal models when appropriate.

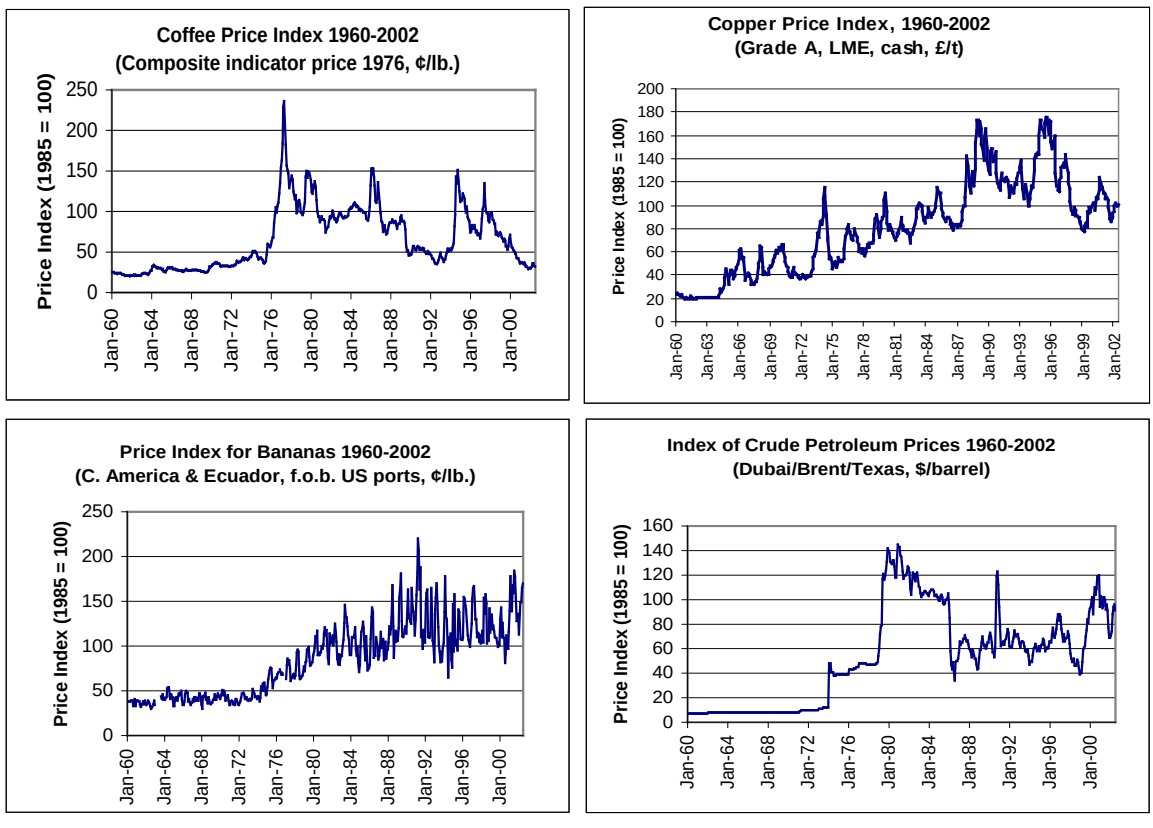
Two key questions for technological development and industrial policy are addressed in the following chapters: Developing countries are being encouraged to liberalise their trade regimes and to specialise according to their areas of current comparative advantage. But is such specialisation always wise? If tariffs have costs, is it also possible that specialisation and export concentration also carry costs and risks? If so, then the debate about industrial policy should shift from the simple assertion that tariffs and other trade measures are 'inefficient' and 'distortionary', to a debate about the costs, benefits and risks of alternative approaches, with a clear acknowledgement from the multilateral institutions that liberalisation is not invariably the first-best policy option for developing countries.

3. Exports, Growth and Poverty

3.1 Commodity Price Volatility and Terms of Trade Trends

Most of the world's poorest countries are highly dependent on commodity exports to generate the foreign currency needed to pay for imports and to pay off loans. Often they export only a narrow range of commodities making them highly vulnerable to price swings. Sapsford (1990, p. 342) estimated that around half the developing countries earn over 50% of their export receipts from just one primary commodity and around three quarters of developing countries earn over 60% of their export receipts from three or fewer primary commodities. Figure 1 illustrates some of these large fluctuations and Table 1 shows instability indices and price trends since 1977.

Figure 1: ***Price indices for coffee, copper, bananas and crude petroleum, 1960-2000.***
Source: *UNCTAD Handbook of Statistics 2002.*



Commodity price volatility and long-term terms of trade declines are well-known problems for poor countries – which is why most want to diversify their economic bases. But developing countries are also being urged to liberalise their trade regimes and to specialise in their areas of current comparative advantage rather than trying to acquire new areas of comparative advantage through an active industrial policy.

It is striking to note that the advice to liberalise and specialise is precisely the opposite of advice given to investors managing portfolios where diversification is fundamental to stability and risk management. New investors are warned on day one: "Don't put all your eggs in one basket".

Table 1: ***Instability indices and trends in monthly market prices.***
Source: Table 8.4, *UNCTAD Handbook of Statistics 2002*.[11]

	Price instability (% variation)		Price trends (in constant 1985 dollars) (average annual % rate of change)	
	1977 - 2001	1998 - 2001	1977 - 2001	1998 - 2001
ALL COMMODITIES	11.6	4.1	-2.8	-2.1
All food	13	5.7	-3.3	-4.7
Food and tropical beverages	13.2	6.1	-3.3	-3.2
Food	15.7	7.2	-2.6	-0.1
Wheat	15.3	6.6	-2.6	2.9
Maize	13	4	-2.6	1.3
Rice	18.6	5.4	-3.7	-16.2
Sugar	34.5	19.2	-2.5	3.9
Beef	12.5	4.1	-3.2	9.4
Bananas	16.9	14.7	-0.6	7
Pepper	40.9	15.2	0.4	-34.3
Soybean meal	13	8.1	-2.8	5.7
Fishmeal	16.9	17.5	-1.5	-5.4
Soybeans	11.9	5.7	-3.3	-3.5
Tropical beverages	20.8	5.1	-5.6	-17.5
Coffee	26	8	-5.1	-21.9
Cocoa	18.6	15.8	-6.9	-12.6
Tea	14.5	10.8	-4.4	-4.1
Vegetable oilseeds and oils	19.7	8.7	-3.5	-17.5
Sunflower oil	18.6	15.7	-3.3	-11.4
Groundnut oil	20.1	3.4	-2.5	-7
Copra	27.5	16.9	-3.7	-22.1
Coconut oil	28.6	17.6	-3.5	-23
Palm kernel oil	29.6	15.5	-3.7	-24.8
Palm oil	26.1	14.5	-3.7	-25.3
Cotton oil	14.2	5.4	-3.3	-15
Agricultural raw materials	11.7	4.4	-2	-0.7
Wool	23.7	7.9	-3.2	-7.5
Jute	20.5	6.4	-3.1	10.1
Sisal	10.7	5.8	-0.9	-2.3
Non-coniferous woods	10.5	1.8	1.4	2.5
Tropical logs	16.4	6.9	-0.6	3.6
Tropical sawnwood	21.6	5.6	2.1	6.7
Plywood	18.1	6.8	1.8	5.3
Linseed oil	21.9	9.9	-2.8	-17.3
Tobacco	8.1	2.4	-1	-1.1
Hides and skins	23.3	24.7	-4.8	27.1
Rubber	21.8	6	-3.6	-3.2

[11] UNCTAD Notes: The growth rate of each period has been calculated using the formula: $\log(p) = a + b(t)$ where p is the price index and t is time. Constant 1985 dollars (current dollars divided by the United Nations unit value index of manufactured goods exported by developed market-economy countries). Price Instability: The measure of price instability is $1/n \sum [(| Y(t) - y(t) |) / y(t)]*100$ where Y(t) is the observed magnitude of the variable. y(t) is the magnitude estimated by fitting an exponential trend to the observed value and n is the number of observations. The vertical bar indicates the absolute value (i.e. disregarding signs). Accordingly, instability is measured as the percentage deviation of the variables concerned from their exponential trend levels for a given period.

Table1 (cont): ***Instability indices and trends in monthly market prices.***
Source: Table 8.4, *UNCTAD Handbook of Statistics 2002*.

	Price instability (% variation)		Price trends (in constant 1985 dollars) (average annual % rate of change)	
	1977 - 2001	1998 - 2001	1977 - 2001	1998 - 2001
Minerals, ores and metals	14	5.8	-1.9	3.4
Phosphate rock	10.6	2.4	-2	2.5
Manganese ore	25.2	3.7	-0.2	1.6
Iron ore	7.7	3.5	-1.8	2.2
Tungsten	23.4	13.7	-7.7	14.5
Aluminium	18.8	6.8	-1.6	5.3
Copper	22.5	7.6	-1.3	2.5
Nickel	25.9	21	-1.4	12.7
Lead	21.8	4	-3.6	-1.4
Tin	17.8	7.2	-7.5	-3.6
Gold	20.3	2.8	-2.3	0.3
Silver	25.5	4.1	-5.4	-5
Crude petroleum	29.3	17.6	-3.4	25.5

Examining carefully the instability and price trends in Table 1, it should come as no surprise that both the range of goods and the types of goods exported appear to be important for development. UNCTAD (2002a & c) estimated that the changes in the incidences of poverty in the least developed countries (LDCs) from the early 1980s to late 1990s are significantly dependent on the main category of exports. In particular, as Figures 2 and 3 show, poverty as measured by the percentage of people living on less than $1 per day and $2 per day, *rose* sharply over the period in both non-oil commodity-exporting LDCs (from 63% to 69%) and in mineral exporters (from 61% to 82%). It *declined* in manufactures exporters (from 30% to 25%), even excluding Bangladesh, the most significant LDC manufactures exporter (from 48% to 44%). The rise in poverty in non-oil commodity exporters is related to the declines in the prices of many commodities over the period:

> At the end of 2001, real non-fuel commodity prices had plunged to one half of their annual average for the period 1979-1981. Large increases in export volume are not translating into large increases in export revenue and the capacity to buy imports. (UNCTAD, 2002b, p. 4).

Figure 2: ***Incidence of extreme poverty ($1 per day poverty line) in LDCs according to export specialisation: 1981-83, 1987-89 & 1997-99*** (from UNCTAD, 2002c, p. 124).

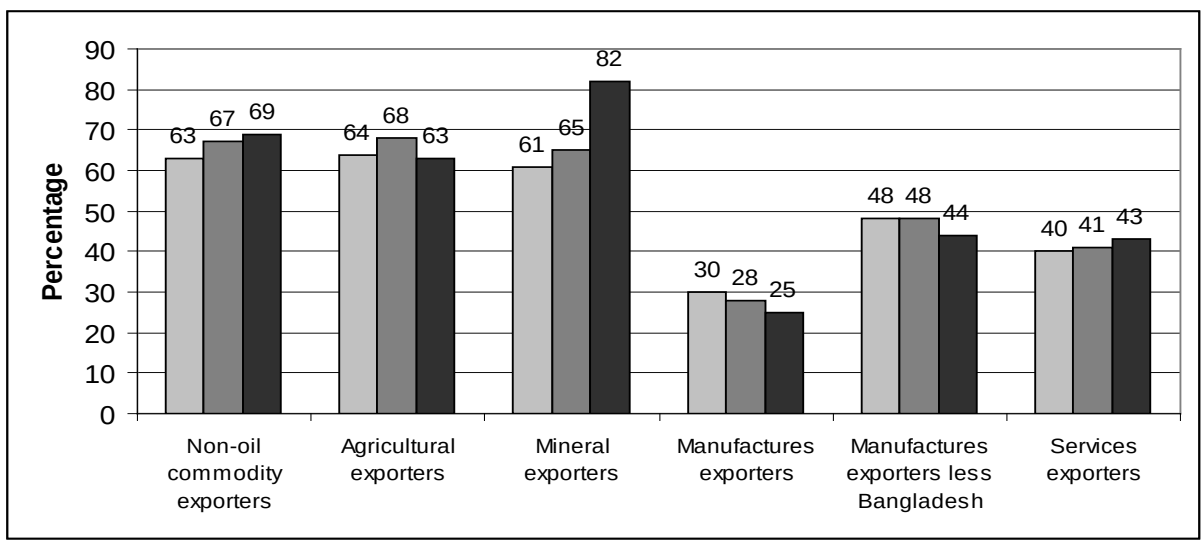
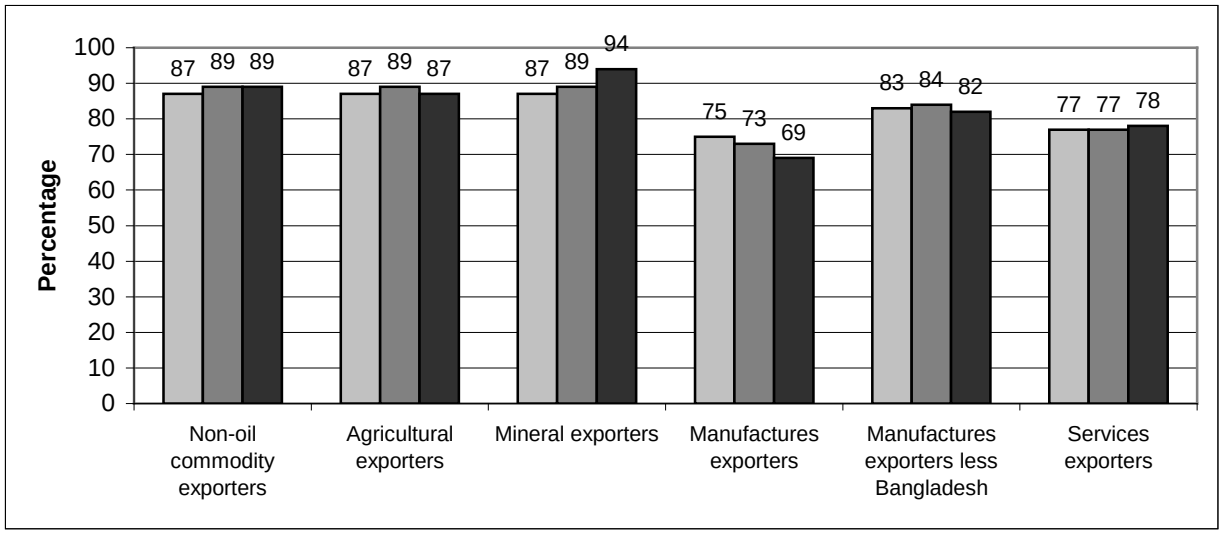


Figure 3: ***Incidence of poverty ($2 per day poverty line) in LDCs according to export specialisation: 1981-83, 1987-89 & 1997-99*** (from UNCTAD, 2002c, p. 124).



A large literature on the effects of export concentration, export volatility and the terms of trade changes on developing countries has emerged since the seminal contributions of Prebisch (1950) and Singer (1950). James Love (various years) has been one of the most prolific writers on export concentration and volatility, generally arguing that as intuitively expected higher concentration and volatility negatively impacts growth, especially through short-run macroeconomic instability. Others, such as MacBean and Nguyen (1980, 1981) and Massell (1964, 1970, 1990) have questioned these results. Lawson and Thanassoulas (1981) for example, dispute the usefulness of the concentration measure because of the possibility of calculating it at different SITC levels. Basu and McLeod (1992) however, found evidence that volatile export prices tend to reduce domestic investment - a result supported by Brock (1991). Ghirmay *et al.* (1999) found a negative relationship between long-run income terms of trade instability and output, but mixed results for the relationship between export instability and output. Gyimah-Brempong (1991) analysed the effects of export instability specifically on Sub-Saharan Africa and found that it had a negative impact on growth. This is partly due to its impact on government revenues since in Sub-Saharan Africa, export taxes are the main source of government revenue. Using a different model Fosu (1992) found weaker evidence for such an effect in Sub-Saharan Africa, but a significantly negative impact of export instability on growth for non-African LDCs.

Turning to the hypothesis of declining terms of trade, the so-called Prebisch-Singer effect, Grilli and Yang (1988) found that the relative prices of non-fuel commodities declined by about 0.6% annually from 1900-1986 compared with the prices of manufactured goods. The resulting net decline of about 40% since 1900 translated approximately (based on 1953 to 1983 data) to a cumulative decline in non-oil-exporting developing countries' terms of trade of at least 11%. Furthermore, non-food agricultural raw materials sustained the heaviest reduction in purchasing power over this period, relative to the prices of manufactures, falling 50%. Bleaney and Greenaway (1993) came to a similar conclusion with an overall decline of just over 0.5% per annum for 1900-1991.

Diakosavvas and Scandizzo (1991) confirmed that the net barter terms of trade for primary commodities do have a tendency to deteriorate, but with three important qualifications: the effect was relatively small in size; it was statistically significant at only the lowest confidence level; and in most cases it reversed itself given a sufficiently long time horizon. Sapsford & Balasubramanyam (1994) reached stronger conclusions, noting that by the early 1990s a large number of studies had demonstrated a decline in the ratio of primary commodity prices to the prices of manufactures over

time, ranging from a minimum of around 0.7% *per annum* to over 1.3% *per annum*. They conclude that the evidence amply supports the declining terms of trade hypothesis. Bloch and Sapsford (1997, 2000) also find evidence of a secular decline.

Studies of average terms of trade effects are useful up to a point, but a disaggregated approach is essential to be able to say much about the prospects for a particular commodity or particular commodity exporting country. Bidarkota and Crucini (2000) for example, studied the relationship between terms of trade and primary commodity prices and found that for the typical developing country, variation in the prices of just three or fewer exported commodities accounted for over 50% of the annual variation in the terms of trade, with a sizable fraction due to a single commodity.

In summary, there does seem to be evidence of a negative effect of export volatility on growth and investment, and of a secular decline in the terms of trade of non-fuel primary commodities. It is not necessary or possible to discuss these debates in detail here. Instead, the focus will be an empirical investigation of the effects of export concentration and different types of exports on terms of trade volatility, purchasing power volatility, growth and poverty. This approach has the advantage of explicitly testing the effects of export concentration, export purchasing power and types of exports on growth and poverty, while sidestepping some of the intricacies of the export volatility and terms of trade debates.

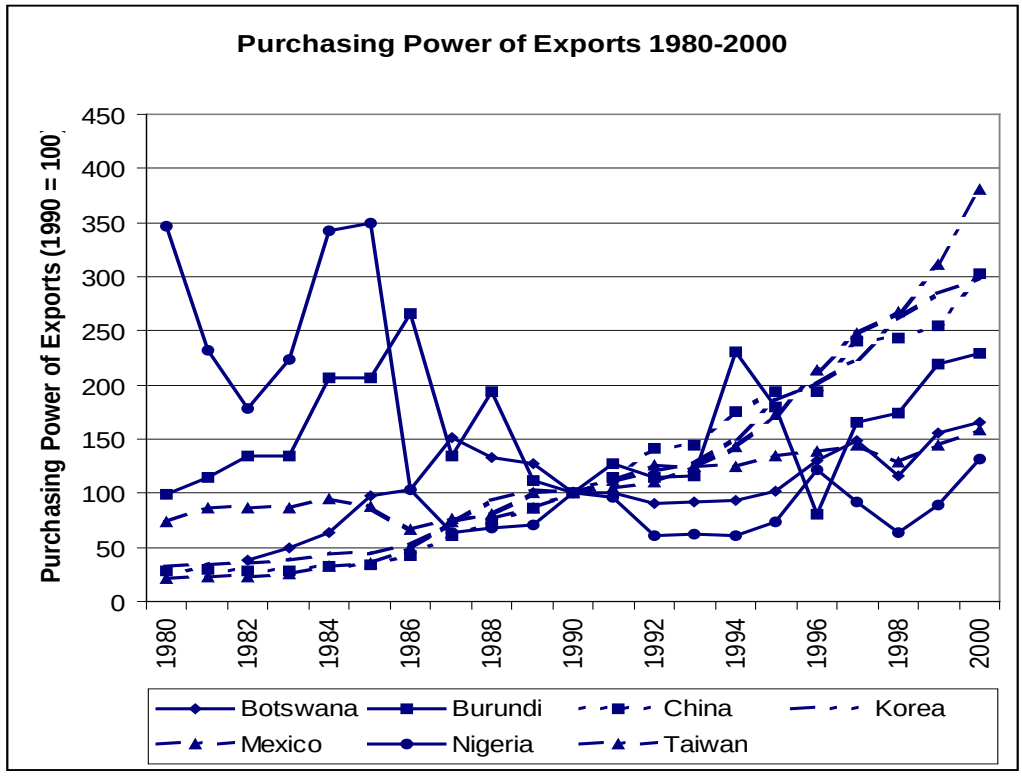
A word is in order first about the focus on exports. Exports are investigated rather than simply the composition of the general economy, for three reasons. First, industries that are exporting are more likely to be efficient producers (see for example, Fafchamps *et al.* 2002). The general domestic economic composition can be quite distorted by inappropriate policies. For example, in a heavily protected economy, a potentially significant proportion of output listed under 'manufacturing' may actually be quite inefficient, even a net cost to the society. Of course, exporters may be inefficient and subsidised, but this is less likely in the present sample of mainly poorer developing countries, than inefficient domestic industries protected by excessive tariffs. Second, because exports are the key source of the foreign currency needed to pay for imports and repay loans. Third, because developing countries are pressured to increase their exports, it matters a great deal if those products a country is exporting are not actually doing much to help it.

As Table 2 and Figure 4 show, a high degree of export concentration is strongly associated with volatility in the purchasing power of exports for some countries.

Table 2: ***Extreme examples of export concentration and diversification (EXCONC)***
1 = maximum concentration; Source: *UNCTAD Handbook of Statistics 2002*.

	Nigeria	**Botswana**	**Burundi**	**Taiwan**	**Korea**	**Mexico**	**China**
Principal Export 1998-99 (SITC Rev. 2, 3 digit level)	Crude Petroleum (333)	Pearl, prec, semi-prec stones (667)	Coffee and substitutes (071)	Transistors, valves etc. (776)	Transistors, valves etc. (776)	Passenger motor vehicles excl. buses (781)	Tele-comm equipment parts & accessories (764)
Principle Export as % of total exports	99.39	83.52	69.29	13.54	14.73	9.49	4.58
EXCONC (2000)	0.996	0.809	0.725	0.171	0.157	0.135	0.073

Figure 4: ***Purchasing power of exports for seven countries over time***
Source: *UNCTAD Handbook of Statistics 2002.*
UNCTAD states that its purchasing power index was constructed in a way to enable consistent cross-country comparisons. The purchasing power of exports is defined as: "The value index of exports deflated by the import unit value index." (UNCTAD, 2002d, p. 396).



Note that since the measure of purchasing power of exports in the above figure is an index number centred on 100 at 1990, the *levels* of purchasing power can only be compared within countries, not between countries. That is to say, we cannot infer from Figure 4 that the purchasing power of the exports of China, Korea and Taiwan are higher than those of Botswana and Burundi. What we can say however is that those countries (in this admittedly small sample) with more diverse economies show a steady increase in the purchasing power of their exports, with low volatility. The countries with only a narrow range of exports such as Nigeria, Botswana and Burundi show instead much more volatile behaviour.

3.2 Panel Data Regressions

Patterns such as those in Figure 4 are interesting but by no means conclusive. What about other countries? To investigate the issue more rigorously, a dataset was constructed for 84 developing countries of five four-year periods covering the years from 1981 to 2000 and a series of multivariate regressions was undertaken. The regression results are presented in Appendix 1 and the country list in Appendix 2. The average (mean) value of each four-year block was used as the observation for each period because in many cases annual observations were not available, particularly for the poverty variables. The variables included in the regressions are defined briefly in Box 2 and described in detail in Appendix 3.

Box 2: Variable Definitions (See Appendix 3 for full details)

BUDGBAL: Overall budget balance, including grants (% of GDP)
BURQ: Bureaucratic quality (scale from 1 to 6 with 6 being best)
CORR: Government corruption (scale from 1 to 6 with 6 being best)
DTOT: Change in the Terms of Trade (TOT Index: 1990=100)
EAP: Dummy variable for East Asia and the Pacific
ETHTENS: Index of ethnic tension (scale from 1 to 6 with 6 being best)
FDI: Foreign direct investment, net inflows (% of GDP)
GDPPERCG: GDP per capita growth (annual %)
IMMDPT: Immunisation rate for Diphtheria-Pertussis (whooping cough)-Tetanus (DPT) (% of children under 12 months)
IMMMEAS: Immunisation rate for measles (% of children under 12 months)
LAC: Dummy variable for Latin America and the Caribbean
LAGRAWEX: Agricultural raw materials exports (natural log of the % of total exports)
LCOMSVEX: Communications, computer, cultural and other services exports (natural log of the % of total exports)
LEXCONC: Export concentration (Natural log of an index EXCONC in which 0 = least concentrated, 1 = maximum concentration)
LEXPCGDP: Exports as a percentage of GDP (natural log)
LFOODEX: Food exports, including processed foods (natural log of the % of total exports)
LFUELEX: Fuel exports (natural log of the % of total exports)
LINFLN: Inflation (given as the natural log of (1+ annual % consumer price inflation/100))
LGDPPERC99: The natural log of GDP per capita (constant 1999 US$) for the final year of the *previous* period
LINFINSVEX: Insurance and financial services exports (natural log of the % of total exports)
LLOWBWBS: Low birth-weight babies (natural log of the % of births)
LLAGM2: Money and quasi money (M2) (natural log of the % of GDP, lagged one-period)
LMANFEX: Manufactures exports (natural log of the % of total exports)
LMETALEX: Ores and metals exports (natural log of the % of total exports)
LPPEXVOL: Volatility of purchasing power of exports (natural log)
LTOTVOL: Terms of trade volatility (natural log)
LTRANSSVEX: Transportation services exports (natural log of the % of total exports)
LTRAVSVEX: Travel services exports (natural log of the % of total exports)
LU5MORT: Under-5 mortality (natural log of the mortality rate of children under five per 1000 live births)
MENA: Dummy variable for Middle East, North Africa, Turkey and Malta
RULE: Rule of law (scale from 1 to 6 with 6 being best)
SA: Dummy variable for South Asia
SRFEMILLITA: Female adult illiteracy rate (square root of the % of females aged 15 and above)
SRFEMILLITY: Female youth Illiteracy rate (square root of the % of females aged 15-24)
SRIMTAX: Import duties (square root of the % tax on imports)
SRINFMORT: Infant mortality (square root of the mortality rate per 1,000 live births)
SRKFORM: Gross fixed capital formation, formerly gross domestic fixed investment (square root of the % of GDP)
SRMALNUTH: Square root of malnutrition among children under 5 by height for age (square root of the % of children under 5)
SRMALNUTW: Square root of malnutrition among children under 5 by weight for age (square root of the % of children under 5)
SSA: Dummy variable for Sub-Saharan Africa
SSCEN: Secondary school enrolment (% net)

Time dummy variables D01, D02, D03, D04, D05 were also used for the economic growth regressions where business cycle effects would play an important role. They were not used for regressions on the poverty indicators though since it is highly unlikely that particular time periods would have worldwide effects on poverty level indicators. M2 lagged one period is a commonly used proxy for the development of the financial sector. The purchasing power of exports (PPEX) is a useful index constructed recently by UNCTAD. It is defined as the value index of exports deflated

by the import unit value index. This is different from the so-called net barter terms of trade (TOT), defined as the ratio of the export unit value index to the import unit value index.

A variety of estimation techniques are possible for such a dataset. Ordinary least squares (OLS) was used when necessary - with robust standard errors (after White, 1980) and specifying that observations were to be treated as independent across countries but not within countries. This modification improves the estimated standard errors of the regression and the variance-covariance matrix of the estimators, but not the value of the coefficients.[12]

OLS has the well-known disadvantage however that it assumes identical coefficients, and therefore identical underlying processes, across every country in the sample. In a sample of 84 countries across five time periods, this is heroic to say the least. Whether such an assumption was valid was therefore tested for each regression with the Breusch-Pagan (BP) Lagrange multiplier test, with the Baltagi-Li (1990) modification for unbalanced panels.[13]

When the BP test indicates that OLS is inappropriate (and it usually did), a better approach is to use a panel data estimator such as the random effects (RE) or fixed effects (FE) model, each of which permits country-specific intercepts. In other words, the panel model estimates the coefficients for the model treating each country as having its own intercept.[14] The RE and FE models may be written:

$$y_{it} = \alpha + x'_{it}\beta + \nu_i + \varepsilon_{it}$$

where $\mathbf{y_{it}}$ is the dependent variable, α is the constant common across every country, β is a *k* x 1 vector of constants (the coefficients being estimated), $\boldsymbol{x_{it}}$ is a *k* x 1 vector of non-constant regressors and parameters, for $i = 1, 2, \ldots N$ cross-section units and t = 1, 2, …T periods. Here **N** = 84 countries and **T** = 5 time periods, for the full sample and ***k*** = the number of variables included in the regression. ν_i represents an unobserved random variable - the country-specific individual disturbance or intercept, which is constant over time. ε_{it} are termed idiosyncratic errors or idiosyncratic disturbances since these change over time, *t*, and across individual countries, *i* (Wooldridge, 2002, p. 251).

Woodridge (2002, p. 251) notes that traditionally, ν_i was called a 'random effect' when it was treated as a random variable, and a 'fixed effect' when treated as a parameter to be estimated for each cross-section observation *i*. Different estimators are used depending on which assumption is held to be most appropriate. Both approaches have their strengths, however, a key assumption underlying the RE model is zero correlation between the observed independent variables and the unobserved effect. i.e.: Cov($\boldsymbol{x_{it}}$, ν_i) = 0, t = 1, 2, …..T. This is a strong assumption, which may be tested using a Hausman test.[15] The FE approach conversely, allows correlation between $\boldsymbol{x_i}$ and ν_i but the gain in robustness comes at the expense of not being able to include time-constant factors in $\boldsymbol{x_i}$. If they were included, there would be no way to distinguish the effects of the constant ν_i from the time-constant $\boldsymbol{x_i}$'s (Wooldridge, 2002, p. 266).

One further complication for panel data analysis of strongly trending series such as infant mortality rates and so on, is autocorrelation in the residuals of the regressions. Each regression was therefore tested for autocorrelation using a test developed by Wooldridge (2002) and documented by Drukker (2003).[16] When evidence of autocorrelation was found, random and fixed effects

[12] This last specification refers to the *cluster* option in Stata.
[13] See Appendix I for details.
[14] For some of the econometric debates over appropriate panel data estimators, see: Ahn and Schmidt (1995, 1997), Arellano and Honoré (2001), Baltagi (2000), Hsiao (2002), Kiviet, (1995) Pesaran & Smith (1995) Phillips and Moon (1999) and Quah (1994).
[15] See Appendix I for details.
[16] This is implemented with Stata's -xtserial- command.

regressions robust to autocorrelation were sometimes undertaken.[17] But a problem with using this approach is that the FE estimator employs a panel by panel Cochrane-Orcutt transformation that reduces the number of observations by the number of countries in the regression sample. Since data for some of the poverty measures may be available for 50 or more countries but only for three or four periods, this technique can result in the loss of many observations - sometimes up to half for cases where data is scarce to begin with. It is highly doubtful in such cases whether the 'gain' from more robust standard errors is worth the loss of information from the dropped observations. More importantly, it is also questionable whether there is much value trying to estimate autoregressive patterns with at most five data points for each country, and often far fewer. It is also stretching credibility to believe a single autocorrelation coefficient (*rho*) evaluated for the whole sample in such circumstances. So while regressions allowing for autocorrelation are sometimes reported, the emphasis for interpretation purposes is on the regular regressions.

Given the preceding discussion of Kenny and Williams (2001), I do not claim that the regressions presented in Appendix I and discussed below are iron-clad. Coefficients are likely to vary somewhat with different country samples, time periods and estimation techniques. Nevertheless, some of the results are quite robust and present a consistent story across different specifications. At the very least, the results warrant further investigation.

Before discussing the results, an important point to bear in mind is that establishing correlation does not prove causality. Causality is extremely difficult to prove. Tests based on Granger (1988) in a time-series context are helpful, but even then 'Granger-causality' is not causality in the commonly understood sense, but in the sense of being useful for prediction. If I claim that washing my car 'Granger-causes' rain, it just means that incidents of my car being washed are statistically useful in predicting rain. It does not demonstrate that washing my car causes rain. Washing my car *may* cause rain, but the events may also be independent with a common third cause, or they may simply be coincidental. For this reason I will tend to use the language of "washing my car is strongly associated with, or correlated with rain" rather than "washing my car causes rain".

The notes at the beginning of Appendix I explain how to interpret Tables A1.1 to A1.14 which follow in that appendix. Individual regressions are referred to by their numbers so that regression 3 in Appendix 1, Table 1 on the log of terms of trade volatility (LTOTVOL) is referred to as A1.1.3.

Table A1.4 shows the results from a number of economic growth regressions. Mindful of the cautions of Kenny and Williams (2001) and Sala-i-Martin (1997), variables were chosen both on the base of generally accepted robustness, such as GDP per capita (LGDPPERC99), gross domestic investment (SRKFORM), a human capital variable and the variables of interest. . The square root of female adult illiteracy (SRFEMILLITA) was chosen as the measure of human capital rather than secondary school enrolment ratios (SSCEN) because data coverage was better and because official enrolment ratios can diverge widely from actual educational outcomes. This is especially true in contexts where underpaid teachers routinely fail to turn up to classes because of the need to hold down a second job to survive. Focusing on female illiteracy rather than general illiteracy also gives a sharper picture of poverty and its gender dimensions.

The regressions perform reasonably well, with several variables significant, and, as expected, showing the importance of the existing level of income (LGDPPERC99) investment (SRKFORM) and the budget balance (BUDGBAL). Surprisingly, the institutional quality variables (RULE, BURQ, CORR) and the degree of ethnic tension (ETHTENS) generally appear to have little direct impact.

Growth is not the same as development of course, and it is important therefore to investigate the effects of export concentration, the purchasing power of exports and different types of exports on poverty. A series of regressions on various poverty measures is presented in Tables A1.5 to A1.14.

[17] Using the -xtregar- commands in Stata. See Baltagi and Wu (1999) for details of the Generalised Least Squares 'random effects' estimator.

Poverty indicators were chosen mainly on the basis of data availability and emphasis on the welfare of women and children. Infant mortality (SRINFMORT) and under-5 mortality (LU5MORT) are good indicators of general poverty levels and data coverage is quite good. Immunisation rates against measles (IMMMEAS) and Diphtheria-Pertussis (Whooping Cough) and Tetanus (IMMDPT) are not only important in themselves, but can serve as a proxy for more general child health issues and community health infrastructure.

Female life expectancy (FEMLIFEXP) reflects the survival rates of girl children, who are often less-favoured, as well as the burden of poverty on women. Female illiteracy rates were next tested for both adults (SRFEMILLITA) and youths aged 15-24 (SRFEMILLITY), this time using secondary school enrolments (SSCEN) as the base human capital variable. Finally, tests on malnutrition as measured by height (SRMALNUTH) and weight (SRMALNUTW), and low birth-weight babies (LLOWBWBS) were conducted.

Measures were chosen to focus particularly on the welfare of women and children since they are generally the most profoundly affected by poverty and oppression. Female literacy and life expectancy are better indicators of poverty than the equivalent average (male and female) indicators because they capture the effects of entrenched gender-biased poverty and inequality in a way that average figures can easily disguise.

As is traditional, each regressor is given a star rating depending on how statistically significant it is. This helps to identify the variables that 'matter' - but matter how much? McCloskey (1992) and others have emphasised on numerous occasions that statistical significance is not the same as economic significance. A coefficient can have a huge t-statistic and so be highly statistically significant, yet be so small that it is of no real economic consequence.

To know whether a statistically significant coefficient actually matters, we need to use the estimated coefficient to calculate the marginal effect of a small change in the regressor of interest on the dependent variable. Here I calculated the approximate marginal effects of a 10% increase in the regressor of interest on the sample mean of the dependent variable. I also used the 95% confidence intervals for the coefficient estimates to calculate the approximate lower and upper 95% confidence limits for the effects of the 10% increases. Strictly speaking this method does not give an exact 95% confidence interval for the marginal effect of the 10% increase, but it does give an indication of the range of marginal effects implied by the confidence interval on the coefficient. These calculations were performed for all of the regressions where export concentration, terms of trade volatility, purchasing power of export volatility or one of the export shares was significant. The results are presented in Table 3.

Note that the percentage changes indicated are approximate[18] and the 10% change refers to the change in the 'base' variable, not its logged or square-rooted version. Likewise the percentage effects given in Table 3 refer to the effects on the 'base' dependent variable, not its transformed version. So the first frame of Table 3 indicates that a 10% increase in export concentration is associated with a 1.72% increase in female adult illiteracy.

[18] They are based on calculus approximations but a sample of analytic calculations involving manual 10% changes to the variables and recalculating the fitted models found the approximations to be within about 5% of the true value.

Table 3: ***Summary of regression results by key independent variables***

Reg. No. = Regression number in Appendix 1. CI = Approximate 95% Confidence Interval
Signif. = Statistical significance at 95% level: *significant at 10%; ** significant at 5%; *** significant at 1%
No/Mixed= CI covers both positive and negative values but effect on sample mean is not beneficial.
Yes/Mixed = CI covers both positive and negative values but effect on sample mean is beneficial.

Independent Variable: Log of Export Concentration, LEXCONC=ln(EXCONC)							
Dependent Variable	Reg. No.	Signif.	Coefficient on LEXCONC	% Effects of a 10% Increase in EXCONC on Dep. Var.			Beneficial Effect of 10% EXCONC Increase?
				Lower 95% CI Limit	Sample Mean	Upper 95% CI Limit	
Terms of Trade Volatility	A1.1.3	***	0.505	2.18	5.05	7.92	No
P.P. of Exports Volatility	A1.3.3	***	0.338	0.50	3.38	6.25	No
GDP per capita growth	A1.4.1c	***	-1.361	-14.98	-8.78	-2.57	No
Infant Mortality	A1.5.1	**	0.444	0.11	1.31	2.51	No
Under 5 Mortality							
Imm. Measles	A1.7.1	***	-19.949	-4.64	-2.99	-1.33	No
Imm. DPT	A1.8.1	***	-17.315	-3.82	-2.53	-1.24	No
Fem. Life Expectancy	A1.9.1	**	-1.582	-0.43	-0.24	-0.04	No
Fem. Illiteracy (Adult)	A1.10.1	**	0.385	0.24	1.72	3.21	No
Fem. Illiteracy (Youth)	A1.11.1	*	0.397	-0.15	2.81	5.76	No/Mixed

Independent Variable: Log of Terms of Trade Volatility, LTOTVOL=ln(TOTVOL)							
Dependent Variable	Reg. No.	Signif.	Coeff. on LTOTVOL	% Effects of a 10% Increase in TOTVOL on Dep. Var.			Beneficial Effect of 10% TOTVOL Increase?
				Lower 95% CI Limit	Sample Mean	Upper 95% CI Limit	
GDP per capita growth	A1.4.2b	***	-0.677	-9.04	-5.42	-1.80	No
Infant Mortality							
Under 5 Mortality							
Imm. Measles	A1.7.2b	***	-4.592	-1.39	-0.71	-0.03	No
Imm. DPT	A1.8.2	***	-5.064	-1.32	-0.77	-0.21	No
Fem. Life Expectancy							
Fem. Illiteracy (Adult)	A1.9.2	***	0.157	0.18	0.64	1.11	No
Fem. Illiteracy (Youth)	A1.10.2	*	0.148	-0.07	0.90	1.87	No/Mixed

Independent Variable: Log of Purchasing Power of Exports Volatility, LPPEXOL=ln(PPEXVOL)							
Dependent Variable	Reg. No.	Signif.	Coeff. on PPEXVOL	% Effects of a 10% Increase in PPEXVOL on Dep. Var.			Beneficial Effect of 10% PPEXVOL Increase?
				Lower 95% CI Limit	Sample Mean	Upper 95% CI Limit	
GDP per capita growth							
Infant Mortality							
Under 5 Mortality							
Imm. Measles	A1.7.3	**	-5.105	-1.44	-0.79	-0.14	No
Imm. DPT	A1.8.3	*	-3.077	-1.01	-0.47	0.07	No/Mixed
Fem. Life Expectancy							
Fem. Illiteracy (Adult)	A1.10.3	**	0.148	0.12	0.61	1.10	No
Fem. Illiteracy (Youth)	A1.11.3	***	0.245	0.55	1.49	2.43	No

Table 3: ***Summary of regression results by key independent variables (cont.)***
Reg. No. = Regression number in Appendix 1. CI = Approximate 95% Confidence Interval
Signif. = Statistical significance at 95% level: *significant at 10%; ** significant at 5%; *** significant at 1%
No/Mixed= CI covers both positive and negative values but effect on sample mean is not beneficial.
Yes/Mixed = CI covers both positive and negative values but effect on sample mean is beneficial.

Independent Variable: Log of Export Category Share, LEXSHR=ln(EXSHR)								
Dependent Variable	**Reg. No.**	**Signif.**	**EXSHR**	**Coeff. on LEXSHR**	**% Effects of a 10% Increase in EXSHR on:**			**Beneficial Effect of 10% EXSHR Increase?**
					Lower 95% CI Limit	**Sample Mean**	**Upper 95% CI Limit**	
GDP per capita growth	A1.4.4b	*	AGRAWEX	0.327	-0.10	2.30	4.70	Yes/Mixed
Fem. Life Expectancy	A1.9.4	**	AGRAWEX	-0.955	-0.28	-0.14	-0.01	No
Malnutrition (by height)	A1.12.4	*	AGRAWEX	0.443	-0.34	1.80	3.94	No/Mixed
P.P. of Exports Volatility	A1.3.6	***	FUELEX	0.108	0.37	1.08	1.80	No
Imm. DPT	A1.8.4a	**	FUELEX	-2.045	-0.57	-0.30	-0.04	No
Fem. Illiteracy (Youth)	A1.11.4b	**	FUELEX	0.259	0.03	0.59	1.15	No
Under 5 Mortality	A1.6.4	*	INFINSVEX	-0.083	-1.83	-0.83	0.16	Yes/Mixed
Terms of Trade Volatility	A1.1.6	**	MANFEX	-0.218	-3.92	-2.18	-0.45	Yes
P.P. of Exports Volatility	A1.3.6	**	MANFEX	-0.211	-4.14	-2.11	-0.08	Yes
GDP per capita growth	A1.4.4b	***	MANFEX	0.564	1.07	3.97	6.87	Yes
Imm. Measles	A1.7.4	**	MANFEX	8.091	0.00	1.22	2.44	Yes
Fem. Life Expectancy	A1.9.4	*	MANFEX	1.171	-0.02	0.18	0.37	Yes/Mixed
Malnutrition (by weight)	A1.13.4b	*	MANFEX	0.353	-0.28	1.80	3.89	No/Mixed
Fem. Illiteracy (Youth)	A1.11.4b	**	METALEX	-0.342	-1.44	-0.78	-0.12	Yes
Malnutrition (by weight)	A1.13.4b	*	METALEX	-0.174	-1.82	-0.89	0.05	Yes/Mixed
Low birth-weight babies	A1.14.4b	**	METALEX	-0.067	-1.30	-0.67	-0.03	Yes
Fem. Life Expectancy	A1.9.4	**	TRAVSVEX	1.088	0.01	0.16	0.31	Yes

3.3 Export Concentration

The first frame of Table 3 summarises the results of the regressions in which export concentration was significant. Regression A1.1.3 may be regarded as the most robust of the terms of trade volatility regressions, since it included both time and regional dummy variables. It can be seen from the first result in Table 3 that the coefficient on the log of export concentration, LEXCONC was 0.505. Given that both terms of trade and export concentration are in logs, the coefficient on LEXCONC gives the elasticity of the terms of trade volatility with respect to export concentration - i.e. the percentage change in TOTVOL for a 1% increase in EXCONC.[19] In this case then, a 10% increase in export concentration is associated with a 5.05% increase in terms of trade volatility. Moreover, under conditions of repeated sampling we can be confident that the estimator used will produce confidence intervals containing the population mean 95% of the time. Here the 95% confidence interval suggests that the 'true' values lies between 2.18% and 7.92%.

Table 4 shows summary statistics of the percentage changes of key variables of interest from one period to the next. Clearly while the average change for export concentration was in fact negative at -4.09%, it had a wide standard deviation of over 19%. Out of a total of 228 observations for the change in export concentration, 30 were greater than 10%, with another 79 less than -10%, so quite large changes were common. The 10% change in export concentration is therefore quite historically plausible and the regression results show that such changes were strongly associated with greater

[19] To see this note that if $\ln Y = \beta \ln X$, then differentiating both sides yields $1/Y*dY = \beta*1/X*dX$, so $\beta = dY/Y / dX/X$ which is the definition of elasticity.

terms of trade volatility. A 10% increase in export concentration was also associated with higher volatility in the purchasing power of exports (+3.38%), and worse measures of infant mortality (+1.31%), immunisation rates against measles (-2.99%) and DPT (-2.53%), female life expectancy (-0.24%) and female illiteracy for both adults (+1.72%) and youths (+2.81%). The OLS regression A1.4.1 also suggests and association with lower economic growth (-8.78%) - a finding that is in agreement with the conclusions of the study by Al-Marhubi (2000). But the choice of estimation technique for A1.4.1 was quite borderline and the results are sensitive this. LEXCONC was not significant using an FE estimator.

Table 4: ***Summary of descriptive statistics for percentage changes between periods for key variables***

Variable	Obs	Mean % Change	Std. Dev.	Min % Change	Max % Change
EXCONC	228	-4.092295	19.39144	-51.66819	142.4261
TOTVOL	318	27.77129	139.282	-89.79315	1453.186
PPEXVOL	322	47.25598	203.9075	-93.14341	2450.903

3.4 Terms of Trade Volatility

In the second frame of Table 3, regression A1.4.2b shows a significant negative association between GDP per capita growth and terms of trade volatility, with the results suggesting that a 10% increase in terms of trade volatility would be associated on average with a growth rate between 9% and 1.8% lower than its previous level, with the most likely outcome a reduction of 5.42%. But again, how common was a 10% change in terms of trade volatility? Very. Out of 318 observations for the percentage change in terms of trade volatility, the mean was 27.8%, 119 were over 10% and 83 of these were over 50%. Using the mean change of 27.8% instead of a 10% increase as a test, we find that a 27.8% change was associated with growth rates between 25.14% and 5.00% lower than usual, with the mean outcome 15.07% lower.

A 10% increase in terms of trade volatility was also associated with lower rates of immunisation against measles (-0.7% at the mean) and DPT (-0.7%), and higher rates of illiteracy in adult females (0.64%). It is also associated with higher youth illiteracy at the mean (0.9%), though overall the confidence interval is mixed so this result is not strong. The associations with these adverse poverty measures, while significant are not large for a 10% increase in terms of trade volatility. But again, if evaluated at the average 27.8% increase in volatility, the figures change to: -1.97% for immunization against measles, -2.13% for immunisation against DPT, +1.79% for female adult illiteracy and +2.5% for female youth illiteracy. Bearing in mind that we are talking about changes over just a four-year time frame and that these percentages represent hundreds of thousands, if not millions of women and children, these figures are not trivial.

To take an example, Peru in 1985-88 had an average rate of female adult illiteracy close to that of the sample mean for regression A1.9.2 of 23.6%. If we assume that Peru's average population of 20,124,335 during that period was about 30% adult women, that makes 6,037,300 adult women, around 1,424,900 of whom were illiterate if the data is to be believed. A 1.7% higher illiteracy rate represents over 24,000 women - and that is for a single, relatively small country for one four-year period.

3.5 Purchasing Power of Exports Volatility

The effects of volatility in the purchasing power of exports seem to be fewer than those of export concentration or terms of trade volatility but those that exist are again clearly negative. As the third frame of Table 3 shows, 10% higher levels of volatility in the purchasing power of exports are

associated with lower rates of immunisation against measles (-0.79%) and DPT (-0.47%), and higher rates of female illiteracy for both adults (+0.61%) and youths (+1.49%). But this time, the 10% increase is even further off the mark historically than it was for terms of trade volatility. In fact, 149 out of the total of 322 observations were over 10%, and as Table 4 shows, the average change in volatility for purchasing power of exports was over 47%.

Applying this larger shock, the associated changes evaluated at the means become: -3.7% for immunisation against measles, -2.19% for immunisation against DPT, +2.8% for female adult illiteracy and +7.0% for female youth illiteracy. These are significant and relatively large effects.

3.6 Types of Exports

The regressions in the fourth frame of Table 3 are those in which the various categories making up total exports were tested. Here a consistent picture again emerges. Higher proportions of fuel exports are, as expected from the chart of crude petroleum prices in Figure 1, correlated with higher levels of purchasing power of exports volatility. More surprisingly, they are also correlated with worse outcomes for immunisation rates of DPT and female youth illiteracy. These both reflect the outcomes of health and education infrastructure and services, which may be cut back when export prices suddenly plunge and governments are forced to cut services.

The results for agricultural raw materials are mixed. The effect of a 10% increase in the proportion of agricultural raw materials shown in growth regression A1.4.4b is mixed, but only just. The result for the mean value is a strong positive association between higher proportions of agricultural raw materials exports and growth - an outcome that might surprise anyone familiar with the prices trends of jute, rubber or cotton. What is going on here?

Figure 5 shows the recent price movements of some of the components of AGRAWEX, along with a composite indicator. Jute is not far from where it began 40 years ago though it has been quite volatile, rubber has declined in price and cotton prices have been wildly erratic. Where then does the more steady increase of the composite indicator come from? Figure 6 shows that the upward trend in agricultural raw material prices is driven mainly by dramatic increases in the prices of tropical forest timber and tobacco. All of the timber products at least tripled their price, (with non-coniferous woods quadrupling their 1960 level) and tobacco came close.

The apparent reliance on unsustainable tropical timber harvesting and carcinogenic tobacco for positive growth among those exporting large volumes of agricultural raw materials is not encouraging and may explain the apparent link between higher agricultural raw materials exports and worse outcomes for female life expectancy and incidences of malnutrition as measured by height.

There could be a few reasons why tropical timber exports may be associated with positive growth effects but negative poverty effects: The capital-intensive enclave operations involved in tropical timber extraction generally have few linkages to the rest of the economy; they are often undertaken by foreign companies who repatriate profits rather than investing in the local economy; and they cause enormous environmental destruction that tends to impact the poor most strongly, especially those who depend on the forests for their livelihoods. It may also be that the results for agricultural raw materials reflect the mixed fortunes of commodities in this category with economies heavily reliant on cotton, jute and rubber contributing the bulk of the adverse poverty associations.

Figure 5: ***Agricultural raw materials prices***
Source: *UNCTAD Handbook of Statistics 2002.*

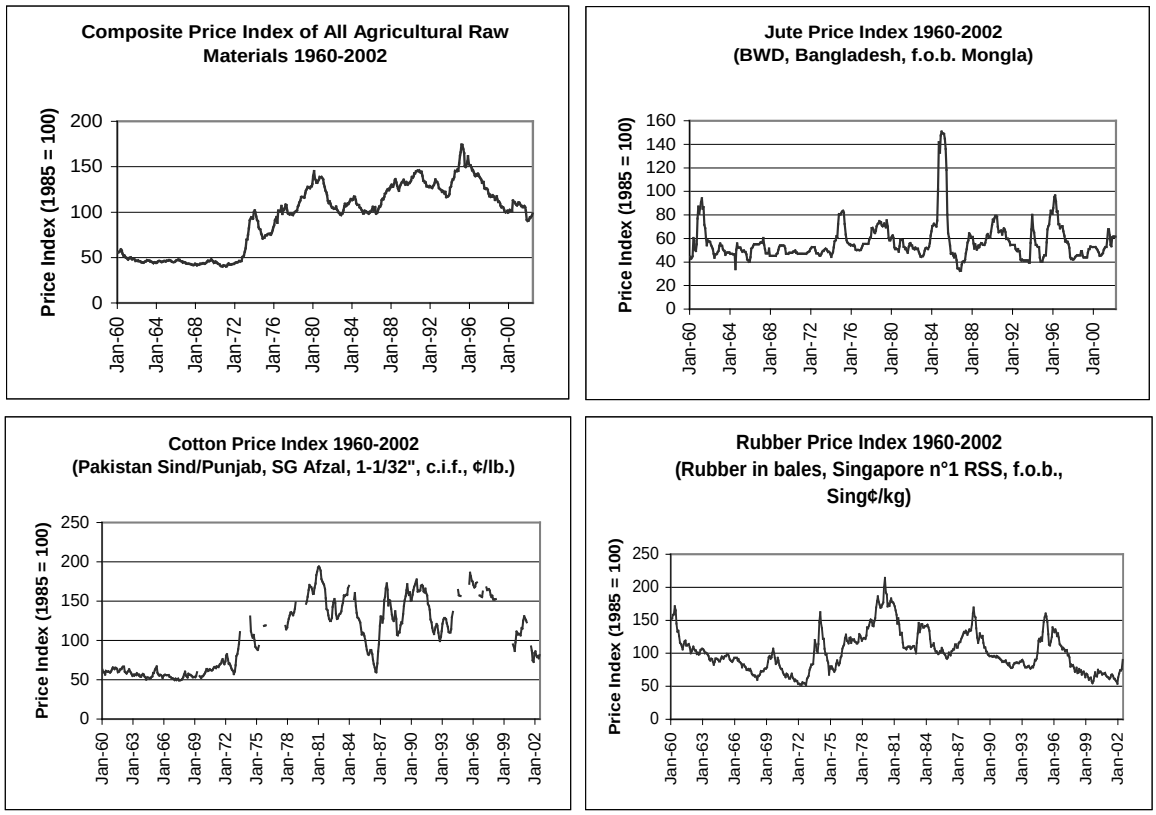
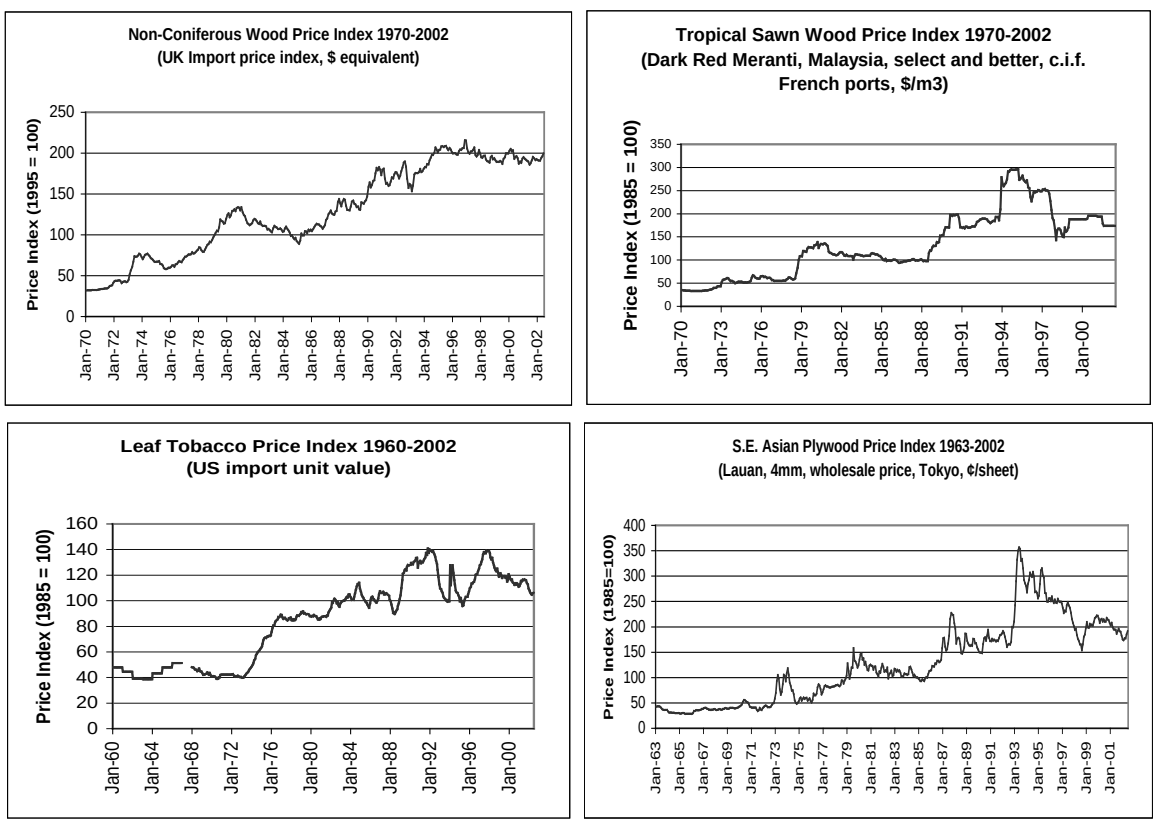


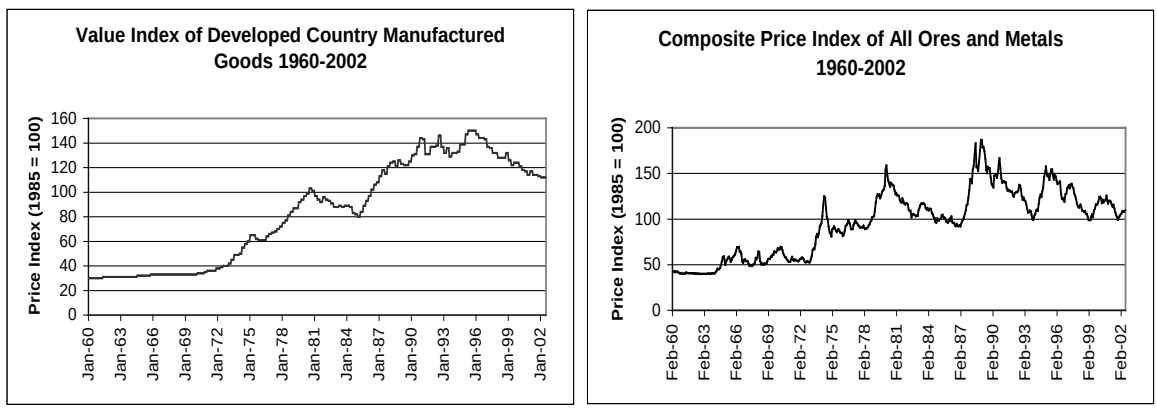
Figure 6: ***Some other agricultural raw materials - tropical timber and tobacco***
Source: *UNCTAD Handbook of Statistics 2002.*



The strongest result from the fourth frame of Table 3 is the overwhelmingly positive contribution of manufactured exports. A 10% increase in the proportion of manufactured exports in total exports is associated with a 2.18% drop in terms of trade volatility, a 2.11% drop in purchasing power of exports volatility, a 3.97% increase in GDP per capita growth, and a 1.22% increase in immunisation rates against measles. Two other results are weaker: Mean female life expectancy increases by 0.18% but malnutrition by weight also increases by 1.8%. Since both these effects are quite small and the confidence interval allows both positive and negative effects, and MANFEX is only significant to 10% level (one star), we should not place too much store on these two results. Still, the positive coefficient on malnutrition is unexpected and may reflect the emergence of countries such as Bangladesh, which now export a significant proportion of manufactures (an average of 74% in 1997-2000) but still have widespread poverty, particularly among children.

The regressions in Table A1.2 of the change in the terms of trade from one period to the next (DTOT) generally have quite low R-squared values (a measure of how much of the variation in the dependent variable the regression explains) so not too much should be read into them.[20] But one interesting and quite robust result stands out - the significant positive coefficients on LMANFEX, suggest that not only does a higher proportion of manufactured goods tend on average to reduce terms of trade volatility, it also tends to be associated with increases in a country's terms of trade. A glance at Figure 7 below shows why that might be the case. The value index of developed country (and most probably) developing country manufactured exports has increased by 400% between 1960 and 1995. They have since declined somewhat, but still, they are 270% higher than the beginning of the period - a far better performance than most commodities.

Figure 7: ***Indexes for developed country manufactured exports and all ores and metals***
Source: *UNCTAD Handbook of Statistics 2002.*



Two other classes of exports have significant but modest correlations with poverty measures. A 10% increase in exports of metals and ores seems to be associated with a 0.78% reduction in female youth illiteracy, a 0.89% reduction in malnutrition by weight and a 0.67% reduction in low birth-weight babies. But the results for metals and ores are fairly fragile. In each case the regressions chosen for evaluation were somewhat borderline and using the next most appropriate estimation technique metals and ores were not significant, or in the case of A1.14.4a were significant but with the opposite sign.

Over the last four decades metal prices have been volatile, but overall as Figure 7 shows, they have more than doubled in price. The positive but relatively weak results on metal and ore exports, may be related to evidence that while a high export concentration in mining may bring in foreign currency when prices are good and the mines are working, it also appears to increase the risk of civil

[20] Similar regressions were performed for PPEXVOL but they performed very poorly, so are not reported.

war (Collier, 2002; Collier and Hoeffler, 2001). Mines are highly capital intensive, are unable to be moved and offer the 'owners' great wealth. A number of rebel movements have used mines to finance their operations. Collier (2002, p. 9) gives a striking example:

> When Laurent Kabilla was marching across the DRC (then called Zaire) en route for Kinshasa, he was interviewed by a journalist. He reportedly said that in Zaire rebellion was easy - all that was needed was $10,000 and a satellite phone. His explanation neatly exemplifies Africa's proneness to civil war - $10,000 was enough to hire a small army, while with a satellite phone it was possible to start making deals on mineral extraction. Kabilla apparently reached $500m of mining deals before reaching Kinshasa. Africa is atypically prone to civil war because of its atypical opportunities for rebellion - unusually low costs, and unusually high revenues.

Lowering countries' dependence on minerals and expanding employment opportunities in labour intensive manufacturing sectors would therefore seem to have the important added benefit of reducing countries' tendencies to civil war.

Finally, a 10% increase in exports of travel services is associated with an increase of 0.31% in female life expectancy. This is not a terribly large effect and the confidence interval puts it close to zero. What is perhaps more surprising is that there was not a greater number of regressions in which travel services were significant, seeing as many countries are hoping to rely on tourism to diversify.

Another point to be noted is the lack of any strong results either way for food exports. This may be due to the offsetting effects of processed and unprocessed food exports, between which the World Bank data does not distinguish. The distinction is important however especially for Africa, which is land-abundant and has a natural comparative advantage in agriculture.

3.7 Conclusions

The results from the regressions suggest that higher levels of export concentration are associated with higher terms of trade volatility, higher volatility of the purchasing power of exports, lower growth and worse poverty. Higher terms of trade volatility is associated with lower growth, and both terms of trade volatility and volatility of purchasing power of exports are associated with worse poverty.

The evidence supports UNCTAD's contention that the types of products a country exports matters. A country that simply liberalises and specialises according to its current comparative advantage no matter what that may be in, may not be taking the wisest course of action. Diversification into manufactures would still appear to offer the surest path to a stronger export profile, stronger long-term growth and better social development.

But how are governments to know what avenues for diversification may be most appropriate for their countries? Several writers have studied developing countries' options for diversification using a portfolio optimisation approach analogous to that developed in finance by Markowitz (1959). Love (1979a), showed that diversification can indeed lower export earning volatility if the country diversifies into products whose price movements are not strongly correlated with current exports. But if the new products are of lower value, there can be a trade-off between greater stability and lower overall value of export earnings. So diversification offers the potential, but not the guarantee of greater stability and higher earnings if undertaken carefully. Alwang and Sielgel (1994) discussed a similar approach for Malawi, Tanzania and Zimbabwe and Labys and Lord (1990) examined Latin American experiences. Both studies found that the portfolio approach can provide useful guidance to policy makers.

The next three chapters discuss the theory and practice of diversification strategies explicitly.

4. Static and Dynamic Comparative Advantage

4.1 The Theory of Comparative Advantage

The theory of comparative advantage was developed initially primarily by David Ricardo (1772-1823), in contrast to the notion of *absolute* advantage emphasised by Adam Smith in *The Wealth of Nations* (1776). Ricardo realised that even if one party had an absolute advantage in the production of two goods, both it and another party could still gain from trade by specialising in producing goods in which each was *relatively* more efficient.[21] So while a country may have no absolute advantage in anything, it will by definition have a comparative advantage in something.

Comparative advantage theory was taken up into neoclassical trade models and used extensively for policy recommendations in both developed and developing countries. There are a number of dangers though in advocating that developing countries should simply liberalise trade and specialise according to their current comparative advantages. Here just three will be considered:

- It is a good theory of static resource allocation efficiencies, but it is not an adequate theory of dynamic long-run growth and development.
- It assumes a static endowment of resources and skills, but resources are developed over time. They are not 'given'.
- It ignores learning and the potential to acquire skills and productive capacity in new industries.

The most critical point is that comparative advantage should not be thought of primarily in static terms. It can and does change over time - an observation that in itself is relatively uncontroversial. Several developing countries have seen their productive energies shift from agriculture through light labour-intensive manufacturing to heavy manufacturing and sophisticated electronics. So clearly, a country's comparative advantage can change. So what?

What is controversial is whether a county's comparative advantage can be intentionally altered and comparative advantage in new fields intentionally acquired. Some major economic figures in the past and the officials of most now-industrialised countries certainly thought so. It was a concept well understood by the nineteenth century architects of the second industrial revolution. Britain only began to advocate free trade after 1846, when it was a technological and military superpower. At that time Germany's and the United States' main comparative advantages were in agriculture but both countries chose not to simply specialise according to their then-current comparative advantage. In the United States, the First US Treasury Secretary Alexander Hamilton (McCraw,1994) and the economist John Rae (Maneschi, 1998b) were the principal architects of American industrial policy. In Germany, Friedrich List (1856)[22] articulated a sophisticated infant industry argument based on his observations of the US experience. By 1914 the United States and Germany were powerful industrial rivals to Great Britain.

In Japan, officials of the Meiji restoration and later the post-war government intentionally set about restructuring and modernising the Japanese economy, using the German strategy as one of their main models.[23] A similar vision drove the governments of Taiwan and Korea, as will be discussed in more detail in the next chapter. The dynamic acquisition of comparative advantage in new industries, using targetted trade restrictions, subsidised credit, export incentives and other interventions were central to their long-run development strategies. It helped propel Korea from one of the poorest countries in Asia in 1960, to an industrialised member of the OECD within a generation. Taiwan likewise has achieved remarkable growth.

[21] See Dornbusch *et al.* (1977) for an example of a Ricardian model with specialisation under free trade.
[22] See also Shafaeddin (2000).
[23] For a good discussion see Shin (1996).

The United Kingdom, United States, France, Germany, Australia, Japan and others all used a battery of policy measures including tariffs and non-tariff trade barriers to nurture their own industries. Tariffs, where they existed, were positively correlated with economic growth for ten now-developed countries between 1875 and 1914: Britain, France, Germany, the United States, Australia, Canada, Denmark, Italy, Norway and Sweden (O'Rourke, 2000).

Again, correlation does not prove causation, and arguably these countries may have grown even faster in the absence of trade restrictions. What can be said conclusively though, is that trade restrictions did not *prevent* the growth of strong industries and per capita income. Since we do not know the counterfactual, detailed micro-level studies of the specific policies of the governments and the effect these policies had on firm behaviour and economic variables are essential.

We are fortunate then that a number of such studies have been undertaken. An extensive 'appreciative' theoretical literature of the type mentioned in Chapter 1 has documented some of the detailed policies used by governments and industries to acquire comparative advantage in new areas in the successful East Asian economies - particularly South Korea and Taiwan.[24] Others have made detailed investigations of the processes of technological change and innovation.[25] These studies are a far cry from neoclassical trade and growth models based on universally available technology blueprints, common production functions and perfect competition.

Chang (2002) has described the growing restrictions on developing countries' industrial policy options under the WTO as the rich countries 'kicking away the ladder' that they themselves used to industrialise. There is considerable truth to Chang's claim. Numerous studies of the economic histories of the United States, Germany and Japan in particular have shown the variety of measures employed by governments to promote their industries, including tariffs and subsidies.[26] In a recent address, Stiglitz (2001, p. 5) reminded his audience of what economic historians have long known:

> The standard models (underlying the Washington consensus) assumed a fixed technology; yet the essence of development is an improvement in technology… Industrial policies, though widely vilified under neo-liberal doctrines, have played an important role in the development of almost all of the successful countries.

The importance of the industrial policy debate lies not only in its historical interest, but in the fact that a number of current and proposed rules under the WTO severely curtail the use of these kinds of interventions and so may prevent other countries following in the footsteps of the now-industrialised countries. For example, Article XVIII of the GATT (WTO, 1994, pp. 510-518) permits assistance via tariffs or subsidies for establishing new industries but requires the developing country implementing the measure to obtain agreement from other affected WTO members and to pay them compensation if requested.

4.2 Dynamic Comparative Advantage

The term 'dynamic comparative advantage' has lacked precise definition, but is commonly used to emphasise the changing and change*able* nature of comparative advantage, in contrast to 'static' comparative advantage. The term is used in this way by Krugman (1987), Grossman & Helpman (1991), and more informally by Amsden (1989).

[24] See for example: Amsden, 1989, 2001; Wade, 1990, 1993, 1994; Rodrik, 1995; Temple, 1997; Mody, 1990; Kim and Ma, 1997; Lall, 2000a & b; Nelson and Pack 1999a & b; Pack and Westphal, 1986; Stiglitz, 1996.
[25] See for example: Fagerberg, 1994; Katz, 1984; Lall, 1992, 2001; List, 1856; Archibugi and Michie, 1998a & b; Dosi *et al.* 1990; Kim and Nelson 2000; Marsili, 2001; Richardson, 1996; and Teubal, 1996.
[26] See for example: Eckes, 1995; Bairoch, 1993; Morris and Adelman, 1989; Odagiri and Goto, 1996; Shafaeddin, 1998; Shin, 1996.

I have previously mentioned a number of studies in the appreciative theoretical tradition. But there are also several examples of formal models supporting measures to nurture infant industries in order to acquire a new comparative advantage.

Dasgupta, and Stiglitz (1988, p. 266) note that learning by doing "implies scale economies in production" involving a form of sunk cost. They conclude that: "There are circumstances in which the traditional infant industry argument is valid; that is, in which welfare is higher with an import ban than with free trade." The point of the infant industry argument argues Stiglitz (1996) is that protection gives a young firm time to gain the experience it needs to lower its production costs to a point where it will be viable and able to withstand competition:

> Critics of this argument claim that if the firm is to be profitable in the long run, it should incur any losses today. But this assumption is based on the premise that capital markets are perfect. With imperfect capital markets, a firm may not be able to sustain the losses that would enable it to produce at a level at which it would eventually become profitable (Stiglitz, 1996, p. 159).

Using dynamic CGE models, Buffie (2001) demonstrated that even holding many of the neoclassical assumptions in place, tariffs and subsidies can be optimal under a variety of circumstances. Overall in fact, his results support a mixed import substitution-export promotion strategy, like that used in East Asia, including "moderate levels of protection, low duties on imported capital goods and substantial export incentives" (p. 184). Buffie describes this approach as an 'import-substitute-then-export' (ISTE) strategy.

Stephen Redding (1999) presented a useful formal general equilibrium model of dynamic comparative advantage, endogenous growth and the welfare effects of trade which hinges on learning and productivity changes.[27] Others such as Krugman (1987), Grossman and Helpman (1991), Young (1991) and Cypher and Dietz (1998), have also presented models of dynamic comparative advantage, but Redding's is significant in its focus on learning and differences in productivity, rather than economies of scale, imperfect competition or declining terms of trade. Since learning and productivity improvements seem to be one of the decisive factors in the success of countries such as Korea and Taiwan, I will discuss Redding's model in some detail.

Essentially, Redding argues that developing countries face a trade-off between specialisation according to their current (static) comparative advantage (usually in commodities or low-technology goods), and entering sectors in which they currently lack a comparative advantage, but could acquire one through learning and productivity growth. He shows that adopting free trade and accepting the resultant specialisation according to current comparative advantage can in fact be welfare reducing in the long-run. Conversely, adopting certain protective measures for particular industries with potential for significant productivity growth may be welfare enhancing under certain conditions. In the model there are two countries 'home' and 'foreign'. Let:

z = a low-technology, traditional good, such as agriculture and textiles, and
h = a high-technology, frontier good, such as manufacturing or electronics
$\mathbf{A}_j$ = productivity in each sector (where j = **z**, **h**). $\mathbf{A}_j$ depends linearly on μ_j which parameterises the *rate* at which knowledge is acquired in producing good j
* = foreign country; **t** = time index. Initially, $t = t_0$.

Assuming free trade and zero transport costs, a country will have a static comparative advantage in the low-tech sector at time **t**, if the opportunity cost (measured in terms of relative productivities) of producing the low-tech good, **z**, compared with the high-tech good, **h**, at home is *lower* than in the foreign economy, i.e. if[28]:

$$A_h(t)/ A_z(t) < A_h^*(t)/ A_z^*(t)$$

[27] See Appendix 4 for a more complete description of the basic specifications of Redding's model.
[28] Redding (1999) p. 20.

Redding then asks whether a policy intervention such as a production subsidy to the high-tech sector in the home country could be welfare improving. For the subsidy to be welfare improving, the dynamic welfare gains from the home country specialising in the subsidised high-tech sector (and hence the foreign country specialising in the low-tech sector), must be greater than the static welfare losses arising from the subsidy and failure to specialise according to the initial static comparative advantage.

Home can be said to have a *static* comparative advantage in low-tech production at time t_0, if the real opportunity cost of producing the low-tech good at time t_0 is lower at home than the foreign country. However, home may at the same time have a *dynamic* comparative advantage in *high-tech* production at time t_0 if the *rate of growth* of the opportunity cost of producing the high-tech good at time t_0 (even with a subsidy) is lower in the home economy than in the foreign country, due to the potential for a faster rate of learning and productivity growth in the home economy.

That is, home will have a dynamic comparative advantage in high-tech production if[29]:

$$\frac{\frac{\partial(A_{h(t)} / A_{z(t)})}{\partial t}}{A_{h(t)} / A_{z(t)}} > \frac{\frac{\partial(A^*_{h(t)} / A^*_{z(t)})}{\partial t}}{A^*_{h(t)} / A^*_{z(t)}}$$

In this case, the initial static comparative advantage of home in the low-tech good will be reduced over time, and will ultimately be reversed, so that if the subsidy were removed in future, home would continue to specialise in the high-tech sector. In fact, Redding argues (p. 34), it is a necessary condition for a subsidy to the high-tech sector to be welfare improving, that the economy eventually acquires a *static* comparative advantage in this sector at some point in the future (eg. at time $\mathbf{t = t_{10}}$). i.e.

$$A_h(t_{10}) / A_z(t_{10}) > A_h^*(t_{10}) / A_z^*(t_{10})$$

Moreover, Redding argues, that the fact that the initial 'static' comparative advantage has to be reversed for the subsidy to be welfare improving implies that the intervention, in this case a subsidy, need only (and in fact must only) be temporary.[30]

An economy's initial pattern of static comparative advantage may mean that under free trade it fails to develop a sector where its potential to learn by doing is large relative to its trading partner's.[31] If that happens, Redding's model suggests that free-trade leading to such premature specialisation will tend to be welfare reducing.

A significant result of the model is that the subsidy to the high-tech sector at home need not necessarily be a 'beggar-thy-neighbour' policy to the foreign country in the long-run. This is because if the potential for productivity growth in the high-tech sector at home exceeds that in the foreign country, *and* the instantaneous welfare losses due to the subsidy and reallocation of resources are outweighed by the long-run benefits, the altered pattern of comparative advantage would produce an overall increase in world welfare.

Redding's approach focusing on long-run opportunity costs highlights the importance of long-run, welfare-based cost-benefit analyses of trade reforms including, where possible, estimations of

[29] Definition and equations adapted from Redding (1999), pp. 33-34.
[30] Redding (1999) p. 34-35.
[31] Redding (1999) p. 31.

shadow prices, since these reflect real opportunity costs far better than market prices.[32] The measures of 'welfare' used to evaluate the test should go beyond simple economic costs and benefits to include equity, regional-balance and strategic considerations.

Two further points should be noted:

First, Redding only considers one source of welfare loss arising from intervention – lower productivity, which results in efficiency and resource losses. This leads him to argue that intervention should take place *only* if the home country's potential for learning and productivity growth is higher than its trading partner. However, there are at least two other important considerations for a country's development strategy that may strengthen the case for targetted intervention:

(i) The inherent dangers of a narrow economic base – particularly one focused on just one or two commodities. These dangers include not only the risks to growth, terms of trade volatility and poverty arising from export concentration discussed in the previous chapter, but also the less often considered long-term effects of the 'brain-drain' from developing countries. Without diverse economic bases, many developing countries are permanently losing their best and brightest people to industries in developed countries, after having invested considerable scarce resources training them to tertiary level.[33] For Africa, the brain drain is reaching a crisis point. UNESCO (1999) estimates that there were only 20,000 engineers and scientists in the whole of Africa in 1992 (about 1 per 10,000 people compared with around 20-50 per 10,000 in the US and EU) and around 30,000 Africans with PhDs outside Africa.

(ii). The possibility that while a number of sectors may not possess dynamic comparative advantages individually even with targeted subsidies due to other factors in the domestic economy (such as lack of suitable suppliers, transport and infrastructure bottlenecks etc), these may *collectively* have dynamic comparative advantages as part of an integrated national development strategy, or 'Big Push' involving the co-ordination of investments across sectors.[34]

It is beyond the scope of this report to consider these issues fully, but long-run cost-benefit analyses should take them into account.

Second, the theory of dynamic comparative helps provide a better theoretical nesting place for the infant industry/import substitution argument in the context of an overall trade and development strategy. It means that the infant industry argument should not be thought of as a regrettable aberration from the 'first best path' of specialisation according to current (static) comparative advantage. Rather, it can in fact be a vital instrument in a more comprehensive and long-run approach to a country's current and potential comparative advantages. It also helps highlight some aspects of the infant industry argument as advocated by List that have often been forgotten:[35]

- List argued for targetted, temporary protection, *not* blanket protection of whole sectors.

- The shift to eventual import liberalisation (after the eventual acquisition of a static comparative advantage) is an *essential* component of the infant industry strategy, just as vital as the initial protection.

[32] The important issue of cost-benefit analysis is discussed in Chapter 6 in the context of foreign investment, but the principles are equally applicable to trade policy. See Dinwiddy and Teal (1996) chapters 6 & 7, and Brent (1998) chapter 6.
[33] Amsden, (1997), p. 469.
[34] This idea was developed originally by Rosenstein-Rodan (1943) and formalised by Murphy, Shleifer, & Vishny, (1989). See also Pack & Westphal (1986).
[35] Shafaeddin, M., (2000). See also: Bruton (1998) and Bruton (1989).

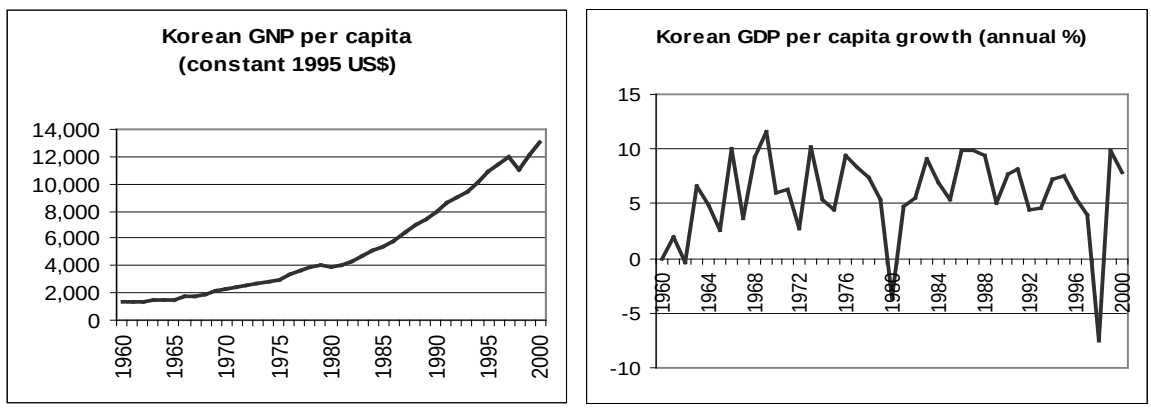
5. Case Study: Korean Development and Government Policies

5.1 The Korean Development Record

The theory of dynamic comparative advantage is a useful framework for understanding aspects of the development of some of the East Asian Newly Industrialised Countries (NICs) such as Korea and Taiwan.[36] The Korean case is examined in some detail here, but not because every developing country either can or should seek to emulate it. Certainly mistakes were made in Korea. But its history is instructive as an example of just how far one country has been able to progress with a carefully nurtured human capital base and competent institutions, by using a well co-ordinated mix of mutually reinforcing policies driven by national development priorities.

By any reckoning, Korea's development record over the past 40 years has been impressive. As the charts in Figures 8 and 9 show, despite being regarded by some as an economic basket-case after the Korean war, it recorded decade after decade of high economic growth per capita, accompanied by dramatic increases in industry value-added and with only moderate inflation. Government debt was kept to manageable levels and exports surged. Interestingly, imports rose before the exports, probably reflecting the need to import capital goods. The industrial base was deliberately widened with a massive increase in investment moving from traditional industries such as textiles, to new industries such as iron and steel, ship-building, petrochemicals, consumer electronics and motor vehicles, all of which had extensive linkages to the rest of economy. Poverty was drastically reduced as real wages rose. English wages took some 70 years to rise by around 150%, whereas Korean manufacturing wages rose by the same amount in just 20 years, from 1955-1976. Even more astounding is the fact that Korean real wages rose by 250% in just one decade, from 1969-1979. (Amsden, 1989, p. 197). Korea joined the OECD in 1996. There were of course downsides, including that the government spent little on social services or welfare, the working week was extremely long and there was no democracy.[37]

Figure 8: ***Korean development indicators***
Source: *World Bank World Development Indicators 2002*



[36] Space precludes a detailed examination of Taiwanese development. See however Wade (1990), Rodrik (1995a) and Thorbecke and Wan (1999) for good overviews.
[37] Responsibility for labour relations in the 1960s lay with the Korean Central Intelligence Agency. (Amsden, 1989, p. 208). The working week in some companies was 56 hours with one or two days off per month.

Figure 8: ***Korean development indicators (cont.)***
Source: *World Bank World Development Indicators 2002*

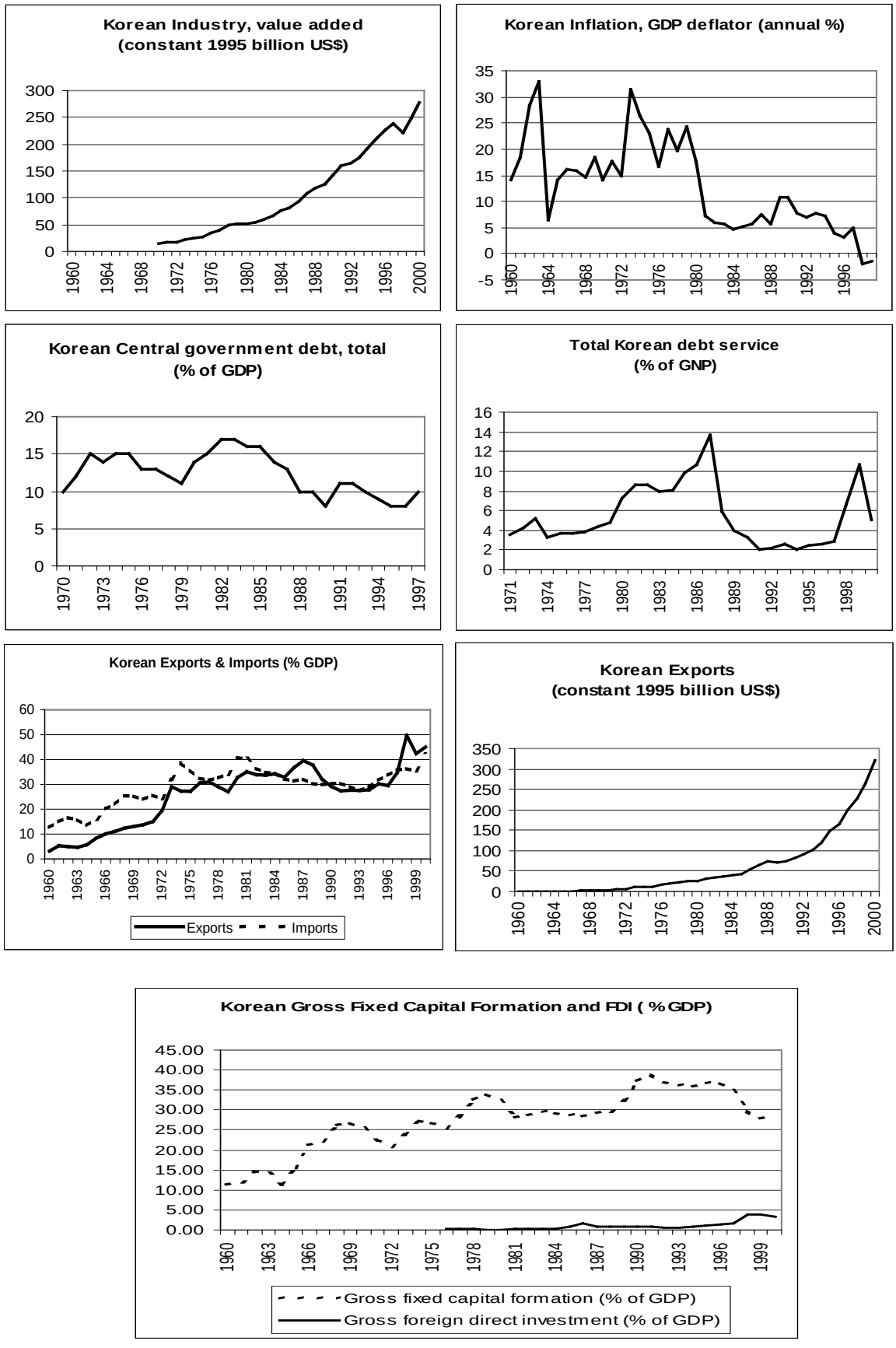
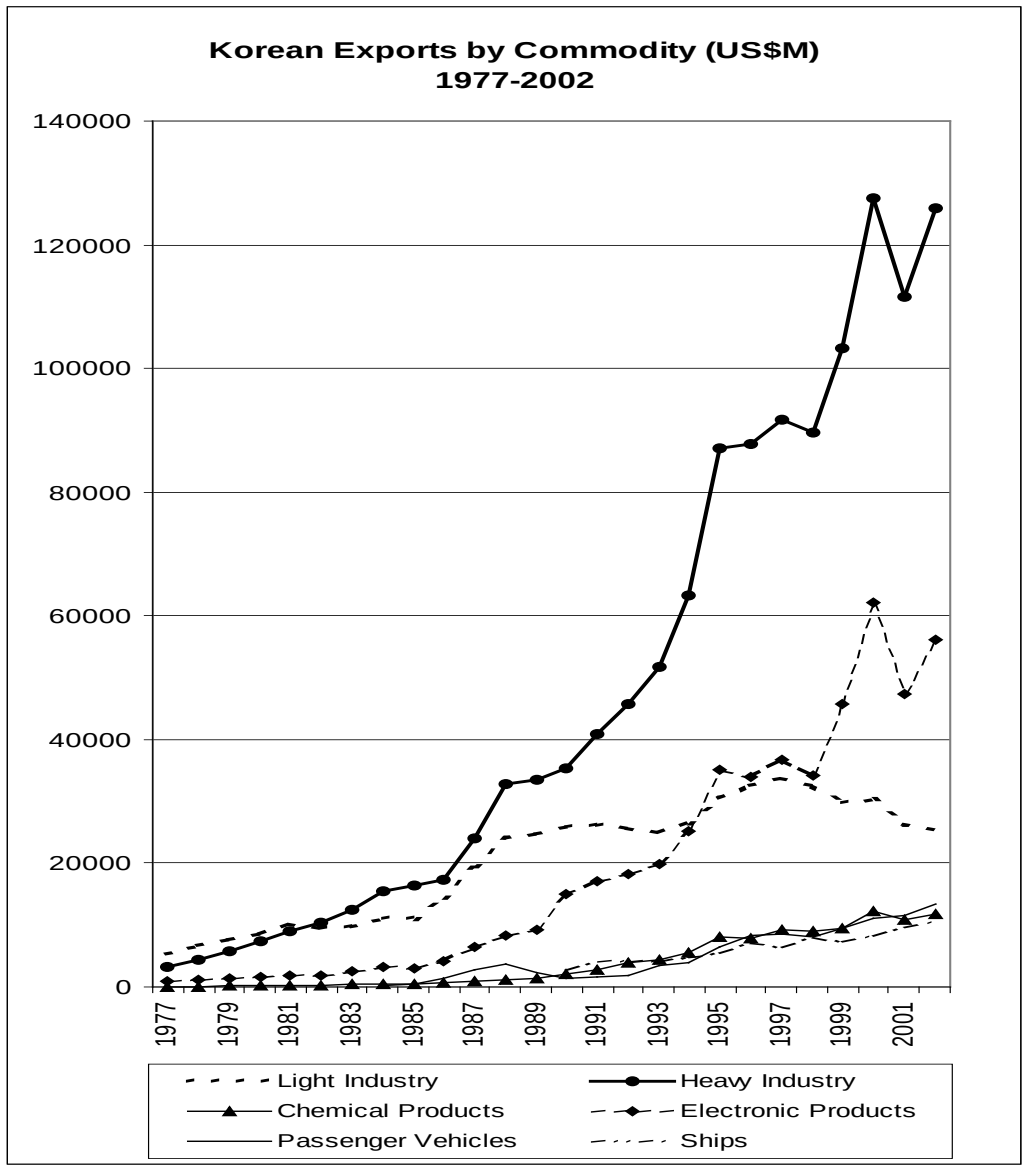


Figure 9: ***Korean exports by commodity, 1977-2002***
Source: Korea National Statistics Office, http://www.nso.go.kr/eng/



5.2 How Much Government Intervention Was There in Korea?

From 1945 until 1961, the South Korean government was weak and divided. From 1961 when General Park Chung Hee became President, until October 1979 when he was assassinated, the Korean government was essentially a highly authoritarian dictatorship. From the beginning, the compact between business and government was forged with the government very much in control.

In the following years, enormous support was provided to business by the government, but always with strict performance requirements, such as export targets and local content requirements. The government also nationalised the banks, meaning that it effectively controlled business's access to credit and capital. These factors kept business on a short leash and oriented their activities to productive investment rather than rent-seeking.[38] In Amsden's view (1989, p. 64): "However clumsy at first, the State used its power to discipline not just workers but the owners and managers of capital as well. A larger surplus was extracted and this was invested rather than consumed."

[38] Amsden (1989), p. 16-17.

5.2.1 Strategic Investment Decisions

Large, strategic investment decisions, such as whether to enter ship-building, chemicals and steel-making were made by the government. In the 1960s, the World Bank refused Korea a loan to build an integrated iron and steel plant on the grounds that Korea did not have a comparative advantage in steel. The government went ahead anyway, viewing steel as a strategic input for other industries, and invested US$3.6 billion in 1973 to found the government-owned Pohang Iron and Steel Company Limited (POSCO). Today, POSCO is arguably the world's most efficient steel company. Similarly, the government decided that Korea would enter the shipbuilding industry and provided significant and varied assistance (and extensive performance requirements) to Hyundai Heavy Industries to do it.[39]

5.2.2 Policies to Support Business

Subsidies and tax breaks: Subsidies were the backbone of the Korean government's industry policy, particularly subsidised credit at negative real interest rates to specific industries.[40] Such subsidies deliberately distorted relative prices, facilitating investment in otherwise initially unprofitable or risky areas such as steel and shipbuilding. As Amsden argues:

> Industrial expansion depends on savings and investment, but in 'backward' countries especially, savings and investment are in conflict over the ideal interest rate, high in one case, low in the other. In Korea and other late industrializing countries, this conflict has been mediated by the subsidy. Throughout most of the twenty-five years of Korean industrial expansion, long-term credit has been allocated by the government to selected firms at negative real interest rates in order to stimulate specific industries.[41]

Investment: Capital for Korean investment came almost entirely from the government, or from foreign loans. Very little came from foreign direct investment (FDI). In fact, from 1965 to 1988, FDI as a percentage of total foreign capital inflow usually fell below 5%.[42] The dynamics of private investment decisions also required the demonstration of viable domestic opportunities:

> Two factors in Korea worked toward the creation of profitable investment opportunities. The first was … the state, which subsidized diversification into new industries. The second was … education and apprenticeship . … Once the entrepreneurs saw that the managers were capable of managing, that the engineers were capable of producing products that worked, capital investment became a viable option.[43]

Trade Barriers: The government protected developing industries with a wide variety of tariff and non-tariff barriers. Tariffs on products varied depending on the final intended use – highest for pure consumption, rebatable if it was to be used as an input for exports, and low to nil for capital equipment for export production or for R&D.[44] Import-barriers in the domestic market enabled promoted industries to sell at above world prices domestically, and thereby cross-subsidise sometimes less profitable exports. The Korean government never saw import-substitution as antithetical to export promotion – one helped the other. In the 1980s, many barriers were phased out, with the affected industries given ample warning to adjust. It is important to reiterate however, that eventual liberalisation is an essential component of the infant-industry strategy not an abandonment of it.

Bailouts: At times the government bailed out financially troubled firms, especially those encountering difficulties because they were attempting to meet high government export or diversification targets.

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[39] Amsden (1989), pp 269-318. POSCO was privatised in October 2000. See: http://www.posco.co.kr/en/
[40] Amsden (1989), p. 144.
[41] Amsden (1989), p. 144.
[42] Amsden (1989), pp. 9. 76.
[43] Amsden (1989), p. 235.
[44] Amsden (1989), p. 83.

Relieving Co-ordination failures: Rodrik (1996) argues that the government helped alleviate market failures that led to a divergence between private and social returns and lower than optimal investment.

5.2.3 Policies to Discipline Business

Government support and promotion of large diversified business groups (*chaebol*) resulted in one of the most highly concentrated economies in the world. As a result, the government also had to exercise firm discipline over business.[45]

Abandonment or dismemberment: A number of badly run or weak firms and chaebol were either abandoned to bankruptcy or dismembered and fed to other chaebol, even if they had previously enjoyed government support. This was the fate of construction firms such as Kyungnam and Samho, and the Korea Shipbuilding and Engineering Company. Another company, Shinjin, had a larger share of the motor vehicle market in the 1960s than Hyundai, but it went bankrupt and its remnants were transferred by the government to Daewooo.[46]

Export Targets: Challenging export targets were set by the government; so much so that they gave the 'Big Push' into heavy industry of the late 1970s a 'frenetic character'.[47]

Limitations on Capacity Expansion and Market Entry: The government strictly limited the number of firms entering new industries. This was both a discipline on the diversification of individual chaebol and a form of protection for firms already active in the industry. The goal was to ensure a small enough number of firms that economies of scale could be realised while also controlling the expansion of existing firms to reduce the potential for overcapacity.

Controls on Capital Flight: Investors were subject to strict laws against remitting liquid capital overseas. For any amount over $1 million, this included a minimum sentence of 10 years prison and a maximum sentence of death.[48]

Price Controls: A large number of basic commodities were subject to yearly negotiated price controls, aimed at curbing the excesses of monopoly power. By 1986, some 110 commodities such as coffee, gas, flour, sugar, steel, and chemicals were subject to such price controls.[49]

5.2.4 Intra-Firm Dynamics and Learning by Doing

Learning-by-doing within firms was crucial to the process of Korean industrialisation. It included:

- Government investment in education to create a literate and skilled workforce – especially of technicians and engineers.
- Overseas (especially Japanese) technical consultants.
- Purchasing product and process licenses.
- Extensive in-house and overseas training of managers, supervisors, engineers and production workers. For example, in 1972 Hyundai Heavy Industries sent 70 engineers to Scotland to learn how to lay out a shipyard (Amsden, 1989, p. 276) and POSCO trained 597 personnel in 11 fields in Japan and Austria before production commenced (p. 302).

[45] Amsden (1989), p. 121.
[46] Amsden (1989) p. 15.
[47] Amsden (1989) p. 16.
[48] Amsden (1989), p. 17.
[49] Amsden (1989), p. 17.

5.3 Was Industry Policy in Korea Successful?

To a large extent the answer to the question of whether Korean industrial policy was successful hinges on the technical progress and productivity growth of the new industries. Unfortunately, this field is mired in theoretical and empirical controversies.[50] Some researchers, such as Young (1992, 1994a & b, 1995), Krugman (1994b) and Kim & Lau (1994) argue that East Asian (including Korean) growth was due overwhelmingly to factor accumulation (more capital and labour), not productivity growth. Others such as Temple (1997) and Dowling and Summers (1998) argue that TFP growth has been more robust than is commonly appreciated, not least because many authors compare the relative contributions of TFP and factor accumulation to overall growth instead of looking at its *absolute* contribution:

> From this standpoint, even a relatively small TFP contribution within Asia in comparison to industrial countries' terms is much larger absolutely. In Asia a 3 per cent rate of TFP growth may be only 30 per cent of an east Asian growth rate of 10 per cent, while a 1.5 per cent rate of TFP growth may be half of an industrial country growth rate of 3 per cent. Yet this shows that Asian entrepreneurs were able to achieve real cost reductions which were double those achieved in industrial countries.[51]

Rodrik (1998) also points out that one of the inherent difficulties with TFP estimations (and there are many) is that "it is impossible to calculate the technological 'residual' without taking a stand on the form of the underlying production function (and its change over time)".[52] Moreover, whether perfect or imperfect competition is assumed also significantly impacts the results. Felipe (1999) rigorously surveyed the TFP literature and concluded that:

> the theoretical problems underlying the notion of TFP are so significant that the whole concept should be seriously questioned … research on growth in East Asia based on the estimation of TFP growth in an activity subject to decreasing returns. If we are to advance in understanding how East Asia grew during the last 30 years we need new avenues of research.[53]

Lee (1997) took just such a new approach, measuring the degree of maturation of infant industries in Korea by means of trends in a comparative cost index which takes account of both the *effective* rates of protection and currency overvaluation (or undervaluation). Lee found that of the promoted heavy industries in Korea, iron and steel matured around 1983, and electrical machinery around 1978. Precision instruments and non-industrial chemicals tended to mature with statistical significance. Only general machinery and transportation equipment showed no significant evidence of maturing. However, Lee goes on to note: "But these two industries, as favoured industries, probably received more subsidies in the 1970s than in the 1980s. If subsidies were added to effective protection, the maturing trend for favoured industries may turn out clearer." (p. 1275).[54]

As noted in Figure 4 in Chapter 3, the purchasing power of Korean and Taiwanese exports increased significantly and steadily over time, reflecting both the increased stability and welfare that a diversified economic base confers. Comprehensive, long-run, welfare-based evaluations of Korean industrial development are sorely needed. Meanwhile, a strong but qualified case can be made that Korean trade and industry policy was a success. Any account of Korean development must account for two key 'stylised facts': First, the massive, detailed, targeted government intervention in the economy, and second, the fact that within a single generation, Korea has been transformed from one

[50] See for example World Bank (1993) and the barrage of criticism that this report drew: eg. Amsden (1994), Lall (1994), Fishlow *et al.* (1994). See also Wade (1996) for a fascinating account of the political tensions between Japan and the United States over the report.
[51] Dowling & Summers (1998), p. 178.
[52] Rodrik (1998) p. 79.
[53] Felipe (1999), p. 1.
[54] See also Lee (1995) on manufacturing, Choung *et al.* (2000) on the technological deepening of semiconductor firms, Mody (1990) on the electronics industry and Kim & Ma (1997) on the petrochemical industry.

of the poorest countries in Asia to one which by 1999-2000 was manufacturing 19.68% of the value of the world's shipping, 14.99% of its synthetic fabrics, 9.16% of its transistors and valves, 6.91% of its iron and steel plate and 5.35% of its polymers. Perhaps even more telling is the fact that over the period 1999-2000, Korea built 62.27% of the ships and 32.67% of the iron and steel plate built by all developing countries combined (UNCTAD, 2002d, p. 177). If that does not reflect the results of an intentional acquisition of comparative advantage in new fields, I'm not sure what would.

Notwithstanding the need to continue to reform some chaebol and financial institutions, Korea now has a diverse and robust economic base and is ready to tackle the challenge of transforming itself into a knowledge-based economy with world-class R&D. Its plan to do so is considerably more strategic and co-ordinated than that of many OECD countries. The plan includes three goals: i) To make Korea one of the top ten knowledge and information powers through a massive upgrading of the national information infrastructure. ii) To improve the education system to meet OECD standards; iii) to enhance the Korean science and technology base of the G7 nations.[55]

The technological deepening Korea has achieved is remarkable. In a survey of the Korean economy, *The Economist* (2003) cited research by the investment bank Morgan Stanley indicating that Korea already leads the world in broadband internet access: 68% of Korean households subscribed to a broadband service in 2002. The next highest penetration was Hong Kong with around 32%, followed by Canada at around 28%, with the United States on 15% and Western Europe averaging just 8%.

Korea's technological deepening stands in strong contrast to most other developing countries, including those 'second-tier' Asian tiger economies of Malaysia, Thailand and Indonesia, and more dynamic Latin American countries such as Mexico. In his review of the Malaysian, Thai and Indonesian economies, Rasiah (1998, p. 1) concluded that unlike Korea, all three had "failed to lay the institutional foundations for technological deepening, critical to sustain long-term growth". Lall (2000, p. 19) noted that Korea "now has 25 times higher R&D by industry as a proportion of GDP than Mexico, which has roughly the same proportion of manufacturing value added but has remained highly dependent on technology imports." The failure to adequately prepare the ground for technological deepening is particularly concerning as these countries lose their comparative advantage in cheap labour to China and other countries (Lall, 2000a, p. 17).

As Table 5 and Appendix 5 shows, Korea spent more than even the United States on R&D as a proportion of its GNI, ranking just below Japan. It has one of the highest proportions of science and engineering students in the world, and its proportion of scientists and engineers is closing on that of the UK and France. It filed twice as many trademark applications as Canada or Mexico, and more than that of the UK or Australia. Its residents applied for more than twice as many patents as the UK's, more than three times as many as France's, seven times as many as Australia's, more than fifteen times as many as Canada's, 37 times as many as Brazil's and 152 times as many as Mexico's. It earns more than three times as much as Mexico or Brazil from license fees and has already surpassed Australia in its royalty earnings.

Two alternative explanations for Korea's success seem exceedingly unlikely: First, that the net effects of all the interventions cancelled each other out, leaving a standard neo-classical trade and growth story. Second, that Korea would have grown and diversified even faster in the absence of any interventions. This second notion ignores the micro-level evidence that in many cases the government was the instigator in launching and steering the now-successful industries. More seriously, it postulates a *laissez-faire* rate of growth, industrial transformation and technological deepening faster than anything the world has ever seen. It remains plausible therefore to argue that Korea intentionally acquired comparative advantages in new industries and that these have benefited the country and its people.

[55] Dahlman and Andersson (2000: 31). See also Branscomb and Choi (1996), Choi (1996) and Choi and Branscomb (1996).

Table 5: ***Average annual research and development indicators for 1996-2000***
Source: *World Bank World Development Indicators* 2002 CD-Rom.

	R&D expenditure (% of GNI)	Science and engineering students (% of total tertiary students)	Scientists and engineers in R&D (per million people)	Trademark applications filed	Patent applications by residents	Royalty and license fee receipts (Constant 2000 US$m)
Australia	1.71	23.86	3,328.16	58,789	9,192	320.91
Brazil	0.77				1,796	118.94
Canada	1.66	15.71		40,365	4,387	1,285.03
China			459.12	165,122	9,659	70.04
France	2.25	36.59	2,670.96	100,560	19,264	2,174.15
Germany	2.29	47.27	2,841.62	85,770	65,208	3,287.07
India	0.62	24.52	157.91	66,378	3,485	29.36
Japan	2.77		4,934.64	121,861	353,445	8,218.64
Korea	2.66	44.73	2,136.77	87,332	67,043	377.17
Mexico	0.34	31.93		46,146	440	99.52
UK	1.86		2,545.88	70,880	28,019	7,565.67
USA	2.55		4,102.86	260,766	133,857	36,381.39

5.4 Some Korean Lessons

Redding's (1999) model discussed in Chapter 4 provides a useful theoretical framework for understanding how the increases in productivity gained through learning in Korea helped it to acquire a comparative advantage in new industries. The government's crucial role in setting strategic directions and nurturing the new industries is also widely acknowledged. Are there any general lessons for policy makers, particularly in developing countries, that can be learned from the theory of dynamic comparative advantage as illustrated by Redding's model and Korea's experience?

First, trade policy should be a country-specific component of a domestic development strategy focussing on domestic investment, human capital building, and strengthening institutions and the economic base.[56] This implies that the WTO's mission of advocating blanket free trade for all developing countries no matter what their stage of development or the state of their institutions is flawed.

Second, there is significant evidence to indicate that subsidies, tariffs and other measures to nurture key infant industries can and have played a major role in the acquisition of comparative advantages in Korea, to say nothing of Britain, the US, France, Germany, Japan and Australia. However, designing such policies is not easy. Industries must be those with capacity for significant productivity gains. Exports should be encouraged, and imported inputs should be tariff-free except in exceptional circumstances and protection must be time-limited.

Redding (1999) cautions that the information requirements to implement such policies may be quite large (eg. on rates of productivity growth in the different sectors in each economy under both the proposed subsidy and free trade). Rodrik (1995b, p. 2949) argues however, that the information requirements need not be too heavy and that an input-output table with some knowledge of the industrial structure of more advanced countries would be essentially all policy makers would need. Remember, we are not talking about picking winners on the cutting edge of technology here as in advanced OECD countries. We are talking instead about the process of catching up to industrial leaders, where the next step may be reasonably obvious. Many Koreans felt, for example, that they only had to look across to Japan to see their future.

[56] See Rodrik (2001a & b), and Adelman (2000 and 2001).

Stiglitz also emphasises that 'picking winners' is something of a caricature:

> [I]ndustrial policies were focused not so much on picking winners as on identifying market failures - instances where investors could not capture large potential spillovers …. "Picking winners" seems to imply culling from a fixed pool of applicants to find those with the highest long-run social returns. East Asian governments have instead performed an entrepreneurial role. Entrepreneurship requires combining technological and marketing knowledge, a vision of the future, a willingness to take risks, and an ability to raise capital. In the early stages of development, these ingredients are typically in short supply. The governments of East Asia stepped in to fill the gap - but in a way that promoted rather than thwarted the development of private entrepreneurship (Stiglitz, 1996, p. 162).

Tariffs, subsidies and other trade distortions harm other developing countries though. Regional free trade agreements with a common external tariff may be better for countries at similar levels of development such as the Southern African Development Community. Successful economic unions have included the unification of the United States in 1800s, the German *Zollverein* (literally a 'toll' or 'tariff union') formed in 1833, almost four decades before political union, and the EU today.

Third, the infant industry argument should not be thought of as antithetical to the supposedly 'first best' policy of specialisation according to static comparative advantage. Rather, properly implemented (*including* the essential later liberalisation phase), it is a means of achieving a country's true potential comparative advantages, taking into account long-run welfare and opportunity costs.

Fourth, good quality institutions and a well-trained, honest and efficient bureaucracy are essential. There is the ever-present risk of hidden welfare costs due to so-called Directly Unproductive Profit-Seeking activities.[57] But competent institutions alone are not enough. As Amsden emphasised:

> The major lesson from successful industrializers after World War II is that whatever the instrument of promotion, to be successful it must be tied to a monitorable performance standard, and operate within a reciprocal control mechanism that disciplines all parties involved in industrial expansion.[58]

Fifth, the Korean (and Taiwanese) situations in 1955-60 were rather unique so their strategies may not be applicable to countries with significantly different initial conditions. They had the most skilled workforces in the developing world. They already had quite good institutions. Both were ethnically homogenous with common internal languages.[59] They had minimal internal ethnic tensions. Both faced external threats (China and North Korea) giving a strong desire for growth. Both received substantial support and latitude in policy decisions from the United States for strategic cold war reasons. Neither had substantial natural resources. Both underwent land reform in the late 1940s-50s, eliminating the landed aristocracy and making wealth distribution more even.[60]

Initial conditions are important. There are countries where the institutions are so weak, corrupt and inefficient that any attempt at a proactive industrial policy will almost certainly end in failure. A proactive diversification strategy must be grounded in the attempt to correct widespread market failures. But if the risk and cost of government failure (even with the best intentions of honest but under-resourced government officials) heavily outweighs the likelihood of success, then a general liberalisation strategy, perhaps retaining a low uniform tariff, may be the 'least worst' option. But for countries with reasonable institutions or those which could be made so with adequate support (a theme taken up in Chapter 7), a judicious mix of industrial policies may be of great long-run benefit.

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[57] See Bhagwati (1982), Krueger (1974), Krugman (1993).
[58] Amsden (2000), p. 14.
[59] In Taiwan there was the distinction between the Mainlanders and the native Taiwanese but the Mainlanders controlled the political system and most of the economic apparatus.
[60] See Rodrik (1994 & 1995 a & b) on Korea and Taiwan, Oyejide (1999) on the relevance of the Korean and Taiwanese models for Africa and Guha (1994) for India.

6. Foreign Investment and Development

6.1 The Developmental Context of FDI

In March 2002 the UN hosted a major international conference on Financing for Development in Monterrey, Mexico in recognition of the crisis in development funding. In the context of relatively stagnant support for aid and concerns over the volatility of portfolio investment in the wake of the Asian financial crisis, many look to an increased role for foreign direct investment (FDI) as a way of boosting finance for development.

Along with trade liberalisation, the imperative for developing countries to entice more FDI has become a mantra emanating from major international institutions such as the World Bank, IMF, WTO and OECD. An attempt was made in the 1990s to negotiate a Multilateral Agreement on Investment (MAI) under the auspices of the OECD, but the effort collapsed. More recently, a number of WTO member countries, particularly the EC, have been pushing hard for negotiations on investment in the WTO - in the face of determined opposition from countries such as India.[61] The growing emphasis on FDI by such powerful institutions is displacing adequate debate on the scandalously low aid levels and fostering an uncritical stance towards FDI itself.

FDI flows rose 18% in 2000, to a record $1.3 trillion fuelled by the 'tech bubble' and the wave of mergers and acquisitions that had begun in earnest the previous year (UNCTAD, 2001a). Since the collapse of the bubble and the beginning of the global economic slowdown, they have declined dramatically and no recovery is expected in 2003 (UNCTAD, 2003). Total FDI flows to developing countries fell from $238 billion in 2000 to $205 billion in 2001, with most of the decline borne by Brazil, Argentina and Hong Kong. FDI to Africa rose from $9 billion in 2000 to $17 billion in 2001 but the impressive increase was due almost entirely to a small number of capital-intensive projects in South Africa and Morocco (UNCTAD, 2002e, p. xvii).

FDI flows into developing countries are dwarfed by flows to the wealthier OECD countries. To what extent then can FDI fill the gap in providing "financing for development"? Given the urgency of the need for external resources, should FDI be sought out and accepted uncritically? And what is the appropriate role for transnational corporations (TNCs), and corporate codes of conduct in the development of poor countries? For many people this last question hardly warrants consideration. In an era of 'corporate globalisation', the TNCs are the enemy – and no good can come from consorting with the enemy.[62]

Things are not so simple though. There are both benefits and costs to FDI by TNCs in developing countries. This chapter explores some aspects of the costs and benefits of FDI, and in particular the question of appropriate FDI policies.

6.1.1 FDI and Economic Growth

Investment has long been recognised as one of the keys to economic development, though its precise relation to economic growth remains controversial. In the regressions conducted for this study, domestic investment (SRKFORM) was strongly associated with growth in almost every regression in Table A1.4, whereas the significance of FDI was quite sensitive to the estimation technique. While some studies, such as that of de Long and Summers (1991 & 1992), concluded that

[61] See for example the submission by India (India , 2002) to the WTO Working Group on the Relationship between Trade and Investment on behalf of China, Cuba, India, Kenya, Pakistan and Zimbabwe. The document addresses many of the potential costs as well as benefits of FDI.

[62] One recent book was even called *Corporations Are Gonna Get Your Mama* (Danaher, 1997).

the rate of capital formation, *determines* the rate of growth, others, such as Blomström *et al.* (1996) refuted this claim. They argue that while fixed (capital equipment) investment may be important, other factors such as institutions, the economic and political climate, inflows of FDI, lower population growth, and the efficient use of investment are also critical for strong growth.

Poon and Thompson (1998) analysed FDI and growth data between 1987 and 1994 and concluded that Japanese manufacturing FDI to Asia, and US service FDI to Latin America, both contributed to the growth of those regions. On the basis of a time series and panel data analysis of FDI and growth, de Mello (1999) showed that while FDI is meant to increase growth in recipient countries via technological upgrading and knowledge spillovers, in fact, its effects are sensitive to the degree of complementarity and substitution between FDI and domestic investment. Moreover, in his earlier survey of the effects of FDI on developing countries, he concluded that the final impact of FDI on output growth depends on the scope for efficiency spillovers to domestic firms (de Mello, 1997). It is by means of such spillovers that FDI leads to increasing returns in domestic production, and increases in the value-added content of FDI-related production.

In other words, FDI certainly can contribute to economic growth, but whether it does so, and the extent to which is does so, are significantly influenced by other factors specific to the local economic environment. The appropriate role of FDI and TNCs must therefore be viewed in the much larger context of an appropriate domestic development strategy. It is here that one of the principal dangers of an unbalanced approach to FDI lies.

6.1.2 The Importance of a Domestic Development and Investment Strategy

Dani Rodrik has been particularly scathing of an uncritical approach to global economic integration. In his view, such an approach allows an obsession with integrating into the global economy to obscure the necessity for the careful formulation of a sound domestic development strategy:

> Countries that have done well in the postwar period are those that have been able to formulate a *domestic* investment strategy to kick-start growth and those that have had the appropriate institutions to handle adverse external shocks, not those that have relied on reduced barriers to trade and capital flows. …. Policy makers therefore have to focus on the fundamentals of economic growth – investment, macroeconomic stability, human resources, and good governance – and not let international economic integration dominate their thinking on development. (Rodrik, 1999, p. 1).

He is particularly critical of an overemphasis on trade and capital market liberalisation:

> Global integration has become, for all practical purposes, a substitute for a development strategy. This trend is bad news for the world's poor. The new agenda of global integration rests on shaky empirical ground and seriously distorts policy-maker's priorities. By focusing on international integration, governments in poor nations divert human resources, administrative capabilities, and political capital away from more urgent development priorities such as education, public health, industrial capacity, and social cohesion. … [G]lobalization is not a short-cut to development. …. Policy-makers need to forge a domestic growth strategy by relying on domestic investors and domestic institutions. The costliest downside of the integrationist faith is that it crowds out serious thinking and efforts along such lines. (Rodrik, 2001, p. 55).

Illustrative of Rodrik's emphasis on the importance of a domestic development strategy is Korea's well-known aversion to FDI in the early stages of its development. As mentioned in the previous chapter, the Korean government had an explicit strategy of developing domestic technical capability through technology licensing, financed through foreign loans and import taxes rather than through FDI, except in the light manufacturing export sector. Even today, FDI for most countries is not more than 10% of total investment, although those countries with ratios equal to or above 15% increased from 7% to almost 25% between the 1970s and late 1990s (UNCTAD, 1999b, p. 168).

Rodrik's emphases on the importance of a domestic investment strategy are all the more pertinent when account is taken of the geographical bias of FDI flows. UNCTAD (2001a) noted that the world's top 30 host countries (including the OECD countries) account for 95% of total world FDI inflows and 90% of stocks. In 2001 the top five FDI recipients accounted for 62% of total FDI flows to developing countries (UNCTAD, 2002e, p. xvi). Kozul-Wright and Rowthorn (1998) also emphasise the regional nature of much FDI. They argue that unlike Malaysia, located at the hub of a fast-growing integrating region, most developing countries will be unable to rely on substantial FDI, and will instead have to rely overwhelmingly on their own resources and domestic producers.

Two major conclusions follow from this section:

First, while FDI can contribute to economic growth, whether it does so is highly dependent on the domestic economic environment.

Second, while FDI will be important for some countries, there is simply not enough FDI to assist most developing countries, especially the poorest. Most such countries still require substantial amounts of ODA to lift their populations out of poverty and all require a well-crafted domestic development and investment strategy.[63]

At a deeper level still, lies the issue of the costs and benefits of the FDI that *is* available. In discussion of FDI, TNCs and codes of conduct, it is often just assumed that FDI is beneficial and that the real question then is the conduct of the companies concerned. It will be argued here that while company conduct, and therefore codes of conduct are obviously important, we must not neglect the prior question of whether a given investment is in fact likely to be of net benefit to the host country. Should developing countries simply solicit and accept any FDI?

6.2. Costs and Benefits of FDI

6.2.1 Cost-Benefit Analysis and FDI

It is widely acknowledged in principle that there are economic and social costs as well as benefits from FDI and the international competition for FDI. But in the rhetoric of international policy debates these costs often seem to be forgotten. Like other major projects, FDI should not be accepted (or solicited) uncritically, but should instead be evaluated in a comprehensive economic and social cost-benefit framework. This should include appropriate shadow prices (especially for government revenue, foreign exchange and labour), discount rates and distributional weights[64].

Shadow prices are prices calculated to take into account the true opportunity costs of resources and inputs and any externalities resulting from the project. These can be negative, such as pollution, congestion or crowding out of domestic capital, or positive, such as technological spillovers or higher productivity.

Appropriate social discount rates are essential because it is well known that private rates of return and discount rates can diverge markedly from optimal social rates of return and discount rates. Private interests tend to discount the future more heavily (i.e. use higher discount rates) than is optimal from a broader social perspective – especially in an environment where property rights or regulations are ill-defined and a 'tragedy of the commons' effect can ensue.

Distributional weights should be used to account for equity considerations. An FDI project which yields 100 already-rich people $50,000 each, is by no means as developmentally effective as one

[63] See also Lensink & White (1998) on this.
[64] See for example: Brent (1998), Dinwiddy & Teal (1996) and Squire (1989).

which yields 50,000 very poor people $100. To ignore distributional weights is to assume an effective distributional weight of 'one' for the 'average' income level. This approach assumes 'a dollar is a dollar', and that an extra dollar's benefit to a rich person is identical to an extra dollar's benefit to a poor person. It may make the calculations easier, but it ignores the vast empirical evidence to the contrary and the entire economic theory of diminishing marginal utility of income.

The over-arching context for the cost-benefit evaluations should be the country's own development strategy, incorporating fundamental goals such as social development, poverty reduction and appropriate industrial diversification. A simplistic financial accounting framework that accepts any project that will 'bring in' $X million and 'create' X-thousand jobs is manifestly inadequate.

Little and Mirrlees (1991), two of the founders of cost-benefit analysis, were highly critical of its woeful neglect by the World Bank in its own projects at the Bank's 1990 Annual Bank Conference on Development Economics. The neglect, they emphasised, was a "shattering indictment" of the Bank's operations, because shadow prices are nothing less than the marginal effects on social welfare of any quantity change. They are the true opportunity costs of a resource use: "Shadow prices and cost-benefit analysis are inseparable. Sometimes actual prices coincide with their shadow values, as if on the equator in the midday sun. Only then is financial analysis also cost-benefit analysis."[65] Unfortunately, its practice by most developing country governments is unlikely to be significantly better than the Bank's.

But if these factors are not taken into account in assessing the desirability of a given FDI, there is no way of knowing beforehand whether the investment will benefit the country or harm it. To assume that FDI *must* be beneficial is ideology – not economics. For example, Young and Miyagiwa (1986) showed that a country can in fact be immizerised through foreign investment via the growth of its labour force, which increases the payments that have to be made to foreign investors. This occurs when both the elasticity of substitution between labour and capital and the elasticity of supply of foreign capital are both low and there is no tax on returns paid to foreign capital.

Such adverse outcomes have also been noted empirically, as Helleiner (1989, p. 1457) and Cardoso and Dornbusch (1989, p. 1415) point out. In particular, both Reuber's (1973) and Lall and Streeten's (1977) studies found that around *one-third* of the foreign investment projects analysed *reduced* the host country's national product. Similarly, Encarnation and Wells (1986) discovered that 25-40% of projects earned *less* in terms of the opportunity costs of resources, than the country paid for them.

Meier (1995, p. 260) presented a useful cost-benefit equation that could be used to evaluate FDI:

$NSB = SP_{outputs} - SP_{inputs}$ + Net Externalities + K inflow + Return to domestic investors + Taxes & Royalties – D & K repatriated in foreign exchange.

NSB = Net Social Benefit; **SP** = shadow price; **D** = Dividends, interest and profits; **K** = capital

As Meier notes: "Considering the stream of social benefits and social costs and discounting to the present, it would be in the interest of the host government to allow entry if the present value of the NSB is greater than 0 at a social discount rate". A small number of cost-benefit analyses have been carried out in an effort to assess the impact of FDI overall on particular countries. Shiong (1997) analysed the costs and benefits of FDI in Malaysia using a Little-Mirrlees (1974) framework, and with/without investment scenarios. Shiong evaluated FDI in Malaysia, and concluded that "the positive benefits of foreign direct investment are far higher than the negative ones, and similar investment should be strongly encouraged".

[65] Little & Mirrlees (1991) as reprinted in Layard & Glaister (1994), p. 210.

Table 6 summarises some of the potential costs and benefits of FDI offsetting them where appropriate. It is illustrative, not exhaustive.

Table 6: ***Summary of potential costs and benefits of FDI***

Potential Costs of FDI	Potential Benefits of FDI
• Potential crowding-out of locally-funded investment	• Increased local investment via availability of new (foreign) capital
• Losses suffered by local entrepreneurs because of greater competition for labour	• Increased employment
• Increased market concentration through loss of domestic competitors	• Increased competition improving overall efficiency
• Investment in enclaves contributing to dualistic economic structures	• Backward (and forward) linkages to domestic industries
• Loss of domestic control over key strategic industries	• Demonstration effects on local industries on issues such as export behaviour, technology choice, managerial practices
• Local staff may be given only junior positions	• Training of local labour and staff turnover from TNCs to domestic firms
• Reduced incentives for local R&D if technological spillovers are extensive	• Technology transfer & spillovers – including technical assistance to suppliers and customers
• Greater risk of withdrawal of investment than with domestic investors	• Cheaper, high-quality locally-manufactured import substitutes
• Negative net resource flows and adverse Balance of Payments outcomes once profits are repatriated	• Tax revenues on the project after the tax holiday period and income tax payments by foreign specialists
• Abuse of transfer pricing leading to loss of government tax revenue	
• Capital inflow causes exchange rate to appreciate	
• Increased inequality	
• Restrictions on subsidiary's exports by parent company	

It is obviously beyond the scope of this chapter to consider all of these issues in detail, so the following discussion will merely highlight some of the most pertinent considerations in evaluating potential FDI, highlighting the diversity of outcomes in different contexts.

6.2.2 FDI and Technological Spillovers

One of the most commonly emphasised potential benefits of FDI is the "technological spillover" effect. But while FDI can undoubtedly facilitate technology transfer, the evidence on this is more mixed than one might be led to believe.

Aitken and Harrison (1999), for example, examined the evidence on the impact of FDI on 4000 firms in Venezuela from 1976-1989 and found that while productivity improved in small plants (with less than 50 employees) with foreign equity participation, it *reduced* the productivity of wholly domestically-owned plants in the same industries. The overall effect of the foreign investment with these two offsetting forces was "quite small", and the gains appeared to be captured entirely by joint ventures. They also "found no evidence of technology 'spillovers' from foreign firms to domestically-owned firms".

Conversely, Chuang and Lin's (1999) study of 8,846 Taiwanese firms using 1991 census data found beneficial spillovers to domestic firms from FDI: A 1% increase in an industry's FDI ratio produced a 1.40-1.88% increase in domestic firm's productivity. However, they also noted that the diffusion of

technological learning can have the effect of *reducing* local firms' incentives to conduct their own R&D. They therefore recommended, once a country's technical capacity has reached a desired level, that policies be introduced to encourage local firms to conduct their own R&D.

Positive externalities from FDI such as technology spillovers are also highly sensitive to market structure and to any strategic interaction between firms. Analysing detailed micro-level data from Indonesian firms, Sjöholm (1999) found that competition increases the degree of spillovers from FDI since it spurs TNCs to transfer more modern technology to their affiliates. Sjöholm's findings reinforce the similar results of Blomström *et al.* (1994) and Kokko (1996). But Blomström and Kokko (1996) also point out that while FDI may initially increase competition in developing countries, it may also eventually reduce it if local firms are driven out of business. This is especially true if the foreign firm engages in unfair, anti-competitive practices, such as predatory pricing, because it is able to sustain heavy initial losses by cross-subsidisation from its parent or affiliate companies. Appropriate FDI policy for a given sector therefore depends on a careful analysis of local market structure to maximise the scope for technological spillovers and other positive externalities. It should not be assumed that they will automatically materialise.

6.2.3 FDI, Wages and Income Inequality

TNCs are often accused of 'exploiting cheap labour', but it is important to bear in mind local wage rates, assuming that these are not kept artificially low by repression and persecution of labour leaders and unions. Given this caveat, evidence suggests that TNCs can have a *positive* effect on local wage rates. Lipsley and Sjöholm's (2001) study of 19,911 firms in Indonesia, and the Aitken *et al.* (1996) analysis of firms in Mexico, Venezuela and the United States, both support the conclusion that TNCs tend to pay higher wages than their local counterparts. In some cases, they also induce local competitors to pay higher wages than they would have otherwise.

The relationship between FDI and income inequality has also been controversial. Recently, Tsai (1995) undertook a major cross-country regression study of the issue, paying particular attention to data comparability and model specification. Tsai also introduced geographical dummy variables, which have largely been absent from previous studies that found that FDI increased inequality. Tsai concluded that the geographical factors in fact capture a large degree of the inequality, and that only in East and South East Asia did FDI appear to have contributed to inequality in the 1970s.[66]

6.2.4 The Trade Regime and Sectoral Considerations

The trade regime and sectoral considerations exert an enormous influence on whether FDI is likely to be beneficial to a country or not and they greatly complicate any facile assumption that FDI is beneficial no matter where is goes. Helleiner (1989, p. 1457) noted, for example, that bad projects with negative social rates of return tend to be systematically associated with higher levels of domestic protection against imports.

Buffie (2001) used a series of optimising dynamic general equilibrium models to investigate the welfare effects of FDI under various trade regimes. He emphasised that the fear that FDI will crowd out domestic investment "is a legitimate economic concern, not just raw xenophobia. When the return on capital exceeds the social time preference rate, crowding out of domestic investment is associated with a welfare loss" (p. 293-294). The potential welfare loss has to be weighed against the purported benefits of FDI. He is particularly critical of FDI in the domestic manufacturing sector, especially if it is protected, since while unemployment may decline in the short run, it generally rises in the long run. Moreover, FDI can crowd out domestic capital so strongly that the aggregate capital stock and employment in the high wage manufacturing sector *decline*.

[66] Tsai emphasises that this result refers only to the marginal effect not the total effect.

Rodríguez-Clare (1996) has shown that the linkage effects and benefits of FDI to the local economy are generally stronger when companies intensively use locally-produced intermediate inputs. When FDI creates enclave economies with few local linkages it can, under some circumstances, harm the developing economy.

In short, it matters what sector of the economy FDI flows into and whether that sector has potential for ongoing strong linkages to the local economy. Poon and Thompson (1998, p. 155) suggest, for example, that Japanese service sector FDI had virtually no impact on economic growth in either Latin America or Asia between 1987 and 1994 because investments in the late 1980s were largely in relatively unproductive real estate.

In addition, investment in some sectors may be directly harmful. There are grave concerns in some developing countries over the increased investment by rich country 'Big Tobacco' companies, with all the associated negative public health externalities that accompany expansion of cigarette production and consumption. Weissman (1998) notes that due to stagnant or declining sales in the developed countries, tobacco companies are increasingly looking to developing countries for their profits. In a similar vein, the South Centre (1997, p. 38) emphasises the social costs of FDI in 'junk food' production and distribution among the poor, especially in urban areas. Such junk food may displace more nutritious (and cheaper) local foods, leading to losses of income for farmers and poorer diets and increased diabetes and heart disease for consumers. It is entirely possible that the net social returns of such investments are negative.

The nature of the trade regime also directly affects optimal FDI policy. Quite different policy recommendations on domestic equity requirements are required depending on whether imports are restricted by tariffs or by quotas, and depending on the degree of capital mobility. Using a general equilibrium model, Chao and Yu (2000) demonstrated that with quotas, increasing the equity requirements improved welfare in the short run but reduced it in the long run. Conversely, with tariffs, domestic equity requirements lower welfare initially but raise it over the long term.

The possibility or threat of FDI can also act endogenously to affect the trade regime itself. Ellingsen and Wärneryd (1999) make the point that since a high level of protection is an inducement for foreign firms to set up domestic operations, this acts as a break on domestic firms' desire for increased protection. The threat of FDI, and hence increased local competition, is likely to be of greater marginal concern than more imports.

6.2.5 FDI, Transfer Pricing and Tax Avoidance

Abuse of intra-firm transfer pricing remains a serious problem for developing country governments dealing with TNCs (UNCTAD, 1999 a & b). Intra-firm trade prices may be under or over-invoiced in order to shift profits for tax purposes or to evade trade taxes or foreign exchange controls. The lack of transparency of such trades and the difficulties of monitoring make transfer pricing one of the main sources of the power disparities between local firms and TNCs.

Transfer prices can be used to cross-subsidise affiliates in order to undercut and drive out local competition. A related problem is the use of tax havens and capital flight. Over-invoicing imports and under-invoicing exports is used to accumulate foreign assets that can then be sold in the black market (Cardoso & Dornbusch, 1989, p. 1427). The incentives to under-invoice imports in order to avoid import taxes work in the opposite direction from incentives to over-invoice in order to effect capital flight. Under-invoicing of exports however, achieves both goals and so, not surprisingly, the practice is rife. Cuddington (1986) for example found that between 1977-1983, exports were under-invoiced by an average of 19.6% in Argentina, 12.7% in Brazil, 12.8% in Chile, 33.6% in Mexico and 27.8% in Uruguay.

More recently, Phillips (1999) reported in the *Wall Street Journal* that the US Internal Revenue Service estimates that transfer pricing abuses costs the US government $2.8 billion each year. Finance professors John Zdanowicz and Simon Pak from Florida International University in Miami put the figure closer to $35.6 billion in 1998:

> Combing through anonymous Customs records, the researchers found $18,000 dot-matrix printers being imported from Japan and $2,600 radial tyres coming from Indonesia. And somebody in the U.S. is exporting $12,000 helicopters to Italy and $135 howitzers to South Africa. (Phillips, 1999, p. 1, A8)

These kinds of results make it difficult to assess the true trade consequences of FDI and undoubtedly result in large losses of fiscal revenues for governments.

6.2.6 FDI and Balance of Payments Considerations

FDI can have unforeseen and unhelpful macroeconomic consequences under the wrong circumstances. In essence the problem is that while the initial investment is a capital inflow, if the investment is profitable it will eventually become a net outflow of foreign exchange as profits are repatriated. While profit repatriation is not necessarily bad in itself since the FDI project can still be a net gain for society, it does mean that the country has to finance the outflow of foreign exchange somehow. If the investment has been productive and in an export sector earning foreign exchange, then it is unlikely to be a problem. But, again returning to sectoral considerations, if the investment was in domestic non-traded services, or in domestic marketing and retailing, especially of imports (such as a supermarket), the foreign exchange demands could be a significant problem (South Centre, 1997, p. 47).

FDI is also assumed to be far more stable than portfolio 'hot money' investments, but this assumption has been questioned by World Bank research. Claessens *et al.* (1995) used time-series analysis of balance of payments data for five industrial and five developing countries and found that long-term flows were often as volatile and at least as unpredictable as short-term flows.

The balance of payments considerations and potential volatility of FDI should therefore not be ignored or underestimated.

6.3 Policy Instruments

This section concentrates on four of the main policy issues influencing the benefits of FDI before a more in-depth discussion of another instrument, corporate codes of conduct, in Section 6.4.

6.3.1 Export Requirements

A number of commentators have highlighted export requirements as an important means by which developing countries can capture more of the benefits of FDI. Rodrik (1987) showed that in the presence of a 'second-best' environment which includes tariffs and oligopolistic behaviour in host-country markets, export-performance requirements can improve national welfare by reducing payments to foreign capital, reducing the output of overproduced commodities, and shifting profits towards domestically-owned firms. Chao and Yu (1996) also showed that for a small 'full employment' economy with tariffs, an investment tax linked with export requirements is the most desirable policy.

In some circumstances, such as FDI in the protected domestic manufacturing sector, Buffie (2001, p. 367) showed that export requirements are the *only* way to ensure that FDI does not *reduce* social welfare. When there is strong crowding out of domestic capital, the export requirement may need to be as high as 55-70% of output.

6.3.2 Technology Transfer and Joint Venture Requirements

Some governments have made technology transfer or joint ventures an explicit condition of FDI, but the results of such policies are mixed. Kokko and Blomström (1995) for example, studied the manufacturing operations of majority-owned foreign affiliates of US TNCs in 33 host countries in 1982. They found technology upgrading and imports were best encouraged by increasing levels of competition to erode the TNCs' technological advantages, and also improving the skills of the local workforce to enhance their capacity to absorb technological improvements. Conversely, they found a negative relationship between performance requirements and technology transfers reflected in data on payments of royalties and license fees. However, such performance requirements had little effect on technology transfer embodied in machinery and equipment.

Joint ventures are one popular means of trying to ensure technology-transfers, but Moran (1998, pp. 9 & 199-125) found scant evidence that they were effective. In general, technology transferred to compulsory joint venture partners tended to be older, and when forced, such alliances are often fraught with difficulties.

6.3.3 Education and Training

Borensztein *et al.* (1998) analysed the effects of FDI on a cross-section of 69 developing countries during the 1970s and 80s, and concluded that FDI was indeed an important vehicle for technology transfer. They also found however, that FDI only led to higher productivity when the host country had a minimum threshold stock of human capital (proxied by educational attainment).[67] They concluded that "FDI contributes to economic growth only when a sufficient absorptive capability of the advanced technologies is available in the host economy" (p. 115). More concerning, they also point out that for countries with low levels of human capital, the direct effects of FDI are negligible or negative (p. 123).

Xu (2000) evaluated the performance of US TNCs as a channel for technology diffusion in 40 countries from 1966 to 1994. He also found that while the technology transfers boosted productivity in developed countries, again they did not do so for less developed countries below a minimum level of human capital availability. Similarly, Blomström and Kokko (1998) found that the positive effects of FDI tended to increase with the level of local labour capability and the degree of competition.

These results highlight the importance once again of a domestic development strategy focused on enhancing national capabilities, particularly the human capital base. Any development strategy wanting to maximise the benefits of FDI should pay close attention to the nutrition, health and education of the nation's children.

6.3.4 Taxes and Incentives

The escalation in incentives designed to lure FDI is a serious challenge because it is a zero-sum game for competing governments. Usher (1977) outlined the complexities of designing an appropriate incentive program, given extensive technical change and the problem of redundancy in incentives. Offering more incentives than are actually needed because of the fear of missing out on a major investment, is a problem exacerbated by competition between governments and is resulting in firms capturing more and more of the benefits of FDI.

Developing countries increasingly try to tempt scarce FDI with elaborate overtures. In 1997, *The Economist* ran a four page 'Promotional Feature' by the Government of Nigeria, then under the dictator General Sani Abacha. The extensive list of incentives offered included the following, showing

[67] A point that is reinforced by Balasubramanyam, *et al.* (1999).

that even openly advertising labour rights violations is not beyond the purview of some governments:

> Under the laws of the export processing zones in Nigeria, investors are exempted from all forms of taxes and levies. They have unrestricted exportation and repatriation of capital and profits rights, duty free importation of goods, exemption of such goods from pre-shipment inspection and 100 percent business ownership, foreign or local. …. Apart from the tax holiday, there is a 10-year ban on labour strikes and lockouts in the zone. Protection of investments is also guaranteed. Getting business done at the Calabar Export Processing Zone is very easy. It is a 'one stop' approval system (Nigeria, 1997).

Public advertisements like this certainly make one wonder what offers are made behind closed doors. But such lavish inducements are by no means confined to the developing world. In 1996, the US State of Alabama won the contract for Daimler-Benz's new plant employing around 1500 people - after Alabama had offered a $300 million package of tax breaks and subsidies - that is, $200,000 per job. The same year, Germany gave Dow Chemical a $6.8 billion subsidy for a plant employing 2000 people, which translates to $3.4 million per job (Moran, 1998, p. 97).[68]

Paying higher subsidies than other countries is by no means a guarantee of securing increased FDI though, as Haaparanta (1996) has shown. With such incentive competition comes the temptation to reduce taxes, but this must also be carefully considered. Chitrakar and Weiss (1995) undertook a cost-benefit evaluation of FDI in Nepal in the 1980s and concluded that FDI had indeed benefited Nepal, but that most of the benefit came through tax revenues – and specifically from sales and excise taxes rather than profit taxes. They therefore urged caution with regard to long tax holidays and that "foreign investment should be approached from a bargaining perspective, rather than one of uncritical welcome" (p. 464).

Buffie (2001, p. 318, 368) also showed that while FDI in an export enclave is normally welfare improving (if profits *aren't* taxed), in a diversified economy that exports both primary products and manufactures, the result is weakened. In fact, FDI "crowds in domestic capital and reduces unemployment only if foreign profits are taxed at a sufficiently high rate. *Ceteris paribus*, the required tax rate is lower the more resource/capital intensive is the export product."

Given the weak evidence for technological spillovers, incentives such as subsidies to attract FDI may not always be wise. Hanson (2001) argued that Brazil's subsidies to motor vehicle manufacturers may have lowered national welfare, whereas Costa Rica was right not to offer subsidies to the computer chip manufacturer Intel.

Competition to offer more and more lavish inducements to potential investors can be inimical to appropriate FDI policies, and can in fact turn otherwise beneficial projects into ones which *reduce* overall welfare. Great care must be taken to ensure that any incentives offered to firms do not tip the balance from a net benefit to a net cost. Again, this 'balance point' will only be located if a proper cost-benefit analysis is undertaken - and that will only be possible if a country has the necessary institutional and analytical capacities.

6.4 Can Corporate Codes of Conduct Ensure Beneficial FDI?

Corporate codes of conduct have proliferated in the last couple of decades. The ILO first issued its *Tripartite Declaration of Principles concerning Multinational Enterprises and Social Policy* in 1977, revising them in 1991 (ILO, 1991). In 2000, the OECD (2000b) revised its 1976 *Guidelines for*

[68] These examples are a small example of the broader problem of state subsidised corporate welfare in both domestic and foreign investment. See the series in *Time* by Barlett and Steele (1998).

Multinational Enterprises after consultation with a wide variety of stakeholders. Beyond these two well-known examples lie thousands of individual company, association and international codes.

What is the role of codes of conduct in promoting beneficial FDI and how effective are they? Here opinions differ markedly.[69] At one extreme, some view voluntary codes of conduct as mere window dressing at best, and misleading public relations exercises at worst. Others see an important role for codes of conduct in 'raising the bar'. Much of course depends on three factors, which will be discussed in turn: the issues that are included in the codes; how these codes are promoted, monitored and enforced; and what gets left out of the codes.

6.4.1 The Content of the Codes

Corporate codes of conduct vary enormously in their scope and purpose. The new OECD *Guidelines for Multinational Enterprises* is a broad international code which if implemented has the potential to improve some aspects of the social and environmental performance of TNCs. In 2000, the OECD (2000a) reviewed 246 other voluntary codes of conduct from companies (48%), associations (37%), partnerships of stakeholders (13%) and international organisations (2%). The codes were dominated by labour and environmental concerns, with consumer protection, bribery and corruption also featuring strongly. It is notable that very few, including the OECD *Guidelines,* are built around a human rights based framework. Yet establishing a framework and mechanisms for mediating between human rights commitments and economic agreements is major gap in the current international architecture.[70]

In an earlier study, Kolk *et al.* (1999) examined 132 codes, including 11 'macro' codes from organisations such as the ILO, OECD, UNCTAD and the WHO, 84 'micro' codes from individual TNCs, and 37 'meso' codes – 13 from social interest groups and 24 from business groups. They analysed the codes in terms of three categories:

Social – including employment, training, working conditions, industrial relations and force;
Environmental – including management policies, input/output, stakeholders, finance and sustainable development;
Generic – including consumer interests, communities, global development, ethics and legal requirements;

Obviously different codes focus on different aspects of these three categories depending on their purpose. For a pro-development and pro-poor agenda, the usefulness of their codes lies not primarily in what issues they cover, but in what difference they will make. In other words, more important than the coverage of particular issues, is a code's *compliance likelihood*:

> Compliance likelihood is determined by the compliance mechanisms included in the codes and the extent to which claims put forward are measurable. The more specific the codes are, the better they can be measured and, subsequently, monitored (Kolk *et al.*, 1999, pp. 153-4).

A major question for the codes is therefore how *specific* they are. Are they simply general platitudes, or are they built around specific goals and targets? On a scale ranging through 'General', 'Frail', 'Moderate', 'Mod/Strong' to 'Strong', Kolk *et al.* (1999, p. 162) found that in fact 45.8% of business groups' codes and 40.5% of firms' codes were 'General', leaving much room for interpretation. Those classed as 'Frail' (predominantly general) accounted for a further 33.3% of business group codes and 20.2% of firm codes. In other words, nearly 80% of business groups' codes and over 50% of firm codes were either completely or predominantly *General*. At the other end of the scale, just 12.5% of business group codes and 25% of firm codes were 'Mod/Strong' or 'Strong', containing predominantly specific prescriptions and restrictions.

[69] See for example Compa (2001).
[70] I am grateful to Kathy Vandergrift of World Vision Canada for this observation.

In order to be able to monitor performance, you need to have something to measure. Yet, when van Tulder and Kolk (2001) analysed codes of conduct in the sporting goods industry, they found that 61% of the 84 general corporate codes of conduct in their reference group contained not a single quantitative standard. None of the sporting goods codes described monitoring systems and processes in any detail. Kolk *et al.* (1999, p. 163) found similar results with only around 10% of codes having more than *one-quarter* of their statements attached to quantifiable measures.

The time horizon that is envisaged in the codes is an important part of measurability. Again, Kolk *et al.* (1999, p. 163) found that 73% of codes had no time horizon defined at all, and a further 13% were vague. In just 14% of cases was the time horizon clear.

Assuming that a more specific measurable code is more likely to influence specific behaviours than a general one, these results suggest that there is a great deal of room for improvement in the content of codes – if their goal is in fact to influence firm behaviour.

6.4.2 Promotion, Monitoring and Enforcement

At least as important as the development of the content of a particular text is the institutional framework that determines the extent to which it is promoted, implemented, monitored and enforced. Here the record is even more patchy.

According to the OECD (2000a, pp. 30 & 35), 66% of the 246 codes they analysed and 71% of all company codes mention some type of monitoring procedure, but these are overwhelmingly internal procedures. That leaves around 30% of codes which do not mention any type of monitoring at all - a result confirmed by van Tulder & Kolk (2001, p. 274). Of the 118 company codes analysed by the OECD, only 45 had provisions for reporting on performance, and of these, only 24 provided for external reporting. More concerning was the finding that only four mentioned independent, external monitoring and only two mentioned a formal complaint body. Kolk *et al.* (1999) reinforce this general picture, discovering that not only do 32% of firms' codes not mention any type of monitoring at all, the majority of firms' codes (58%) only envisage self-monitoring.

Of particular concern is the finding of the Council on Economic Priorities (1998), that of those firms with sourcing guidelines based on labour rights, only 44% actually bothered to monitor the implementation of the codes. Even then, this was again undertaken internally in the vast majority of cases (as cited in Kolk *et al.*, 1999, p. 169).

It is important to emphasise that the need for independent monitoring is directly related to the vagueness of the code:

> Although an independent monitoring party increases compliance likelihood, the strictness of the code also plays a role. If criteria are very strict, even a relatively dependent actor might suffice, whereas independence will be crucial when vagueness prevails. (Kolk *et al.*, 1999, p. 168)

It is hardly surprising that independent monitoring is probably the most neglected dimension of the 'codes of conduct' issue. Fine words and noble intentions are easy to write (and a delight to market) but monitoring transparency and compliance are more painful and entail more far-reaching changes to corporate cultures and practices than many companies are prepared to countenance.

Yet independent monitoring is precisely where the credibility of the codes is forged – or lost. World Vision works with a small number of TNCs around the world – sometimes purely advocating for a change in their practices, and in other cases in partnership. We recently experienced a situation where a company was wanting to work with us. They had an impressive code of conduct, which was meant to be monitored by external auditors. We tried to explain that we couldn't just take their word for it that they were improving conditions in their factories – we needed some external verification. We struggled for months to get them to show us copies of the audits – or at least a

representative sample. Finally we were allowed to view a small number of summaries, with many important details deleted. It was both disappointing and inadequate.

Some codes are quite promising. These include Social Accountability International's SA8000 accreditation system modelled on the ISO9000 'Quality' series[71]; the Code of Labour Practice adopted in 1996 by the Fédération Internationale de Football Association (FIFA) – which includes detailed compliance mechanisms and severe sanctions for non-compliance; and the 1997 WorkPlace Code of Conduct produced by the Apparel Industry Partnership (AIP) – which is more specific than most firm codes, is monitored both by the firms and external monitors and includes sanctions for non-compliance (Kolk *et al.*, 1999, p. 157).

6.4.3 Issues Omitted

Just as important as the issues included in codes of conduct are the issues that are omitted, since it is often these other factors which have a major influence on whether FDI is socially beneficial or harmful in developing countries. The OECD (2000a, pp. 15,16) found that:

- 61% of company codes do not mention disclosure of relevant information.
- Only around 20% have any mention of competition, and most of these are very general.
- Only 32% of codes committed firms against making political contributions.
- Only one code out of 246 mentioned the issue of taxation.

But as has been discussed previously, these issues, particularly degrees of competition and appropriate taxation, are precisely some of the key factors that should be considered in a cost-benefit analysis of FDI.

Disclosure of relevant information and refraining from interfering in the political process by making inappropriate campaign contributions are also critical for well a functioning political system and sound policies, yet these are barely mentioned. The studies of the corporate use and abuse of public relations strategies by Stauber and Rampton (1995) and Beder (1997) suggest that this is a tremendously importance omission.[72] One gem came from the web site of a large PR firm in 1998:

> *[Firm Name]: Managing perceptions that drive performance*
> Perceptions are real. They color what we see ... what we believe ... how we behave. They can be managed ... to motivate behavior ... to create positive business results. … At [Firm Name] we believe that … [t]he role of communications is to manage perceptions in order to motivate behaviors that create positive business results. …In this age of accelerating change and borderless, instantaneous communication, the proactive management of perceptions has never been more important. [Firm Name] is in the Perception Management business. We are focused on adding value to our clients through the use of Perception Management.

Knowing that some companies spend tens of millions of dollars on PR firms such as Burson-Marsteller, Ketchum, Hill and Knowlton and Fleischman-Hillard to 'manage' our perceptions, we can be certain that things are not always as they appear.

A chilling example of the corporate abuse of PR was exposed in 2000 in the respected medical journal *The Lancet* (Ong & Glanz, 2000). The tobacco industry, led by Philip Morris, had attempted to subvert and delay a study on the effects of second-hand smoke undertaken by the WHO's International Agency for Cancer Research, in order to try to prevent more restrictive anti-smoking laws in Europe. The authors maintain that "The documents and interviews suggest that the tobacco industry continues to conduct a sophisticated campaign against conclusions that second-hand smoke causes lung cancer and other diseases, subverting normal scientific processes" (p. 1253).

[71] See: http://www.cepaa.org/introduction.htm
[72] For more, see the Centre for Media and Democracy, http://www.prwatch.org/

Related to the concern about the omissions from codes of conduct, is the role that the codes themselves may be playing in relation to national laws. As Gereffi *et al.* (2001) point out, pre-emptive developments of less-stringent voluntary codes have been used by corporations and business groups to head off binding legislation.

6.4.4 The Place of Codes of Conduct

Voluntary codes of conduct can only go so far towards ensuring positive social benefits from FDI. As discussed previously, far more fundamental is a sound institutional environment with a competent, honest, bureaucracy and judiciary, and laws which protect the environment from excessive pollution and which protect basic workers' rights - such as minimum age, health and safety, the right to organise and collectively bargain, and so on. When the basic legal and political framework is functioning well, codes of conduct can be an added spur to even better performance. They can also be useful in encouraging responsible corporate behaviour in a less than ideal political and legal environment. But codes cannot replace this framework. Most importantly, they should not be used to hinder the development of a proper legal framework, or to mask the need for one.

Kolk *et al.* (1999, p. 171) conclude with an incisive assessment of an important role which codes of conduct do play at the present time:

> Codes – now more than ever before – have the function of deciphering the limits of regulation and the roles of governments, firms and representatives of civil society. Codes are an 'entry to talk'. The agenda-setting potential of codes, therefore should not be underestimated.

Beyond being an 'entry to talk' and helping to set the agenda for future discussions, codes of conduct are probably most useful in proportion to how specific they are and how well they are measured, externally monitored and enforced. Since the vast majority of current codes fail these tests, the more robust codes mentioned previously such as SA8000, FIFA's Code of Labour Practice, and AIP's WorkPlace Code of Conduct, show most promise of enhancing the benefits of FDI in developing countries.

6.4.5 Investment Negotiations in the WTO?

There is no doubt that FDI can contribute to development but a number of caveats may be drawn from the preceding discussion.

First, the scale and geographical scope of FDI falls far short of the extra resource requirements of most developing countries. There remains an urgent need for increased aid, especially for the poorest countries.

Second, while FDI can contribute to economic growth, and more importantly to improved social welfare, it does not always do so. Furthermore, whether it does or not is *not* related wholly to the properties of the specific project, or the conduct of the individual company. Just as important are the economic and social circumstances of the host country – including factors such as levels of human capital, the trade regime, the degree of competition in local markets, the local shadow prices of foreign exchange, labour and capital, and the local social discount rate.

From this it follows, thirdly, that developing countries must be helped to strengthen their institutional capacities to analyse proposed FDI using a social cost-benefit framework combined with economic models appropriate to the country's economy. More broadly, the importance of a sound and competent local institutional framework can hardly be overemphasised. Well-crafted, appropriate and dutifully enforced competition, tax, labour, health and safety, environmental laws are essential to ensuring that FDI improves overall welfare.

Fourth, on the international policy front, developing countries must retain the freedom to devise FDI policies appropriate to their own circumstances, including measures such as export performance requirements and restrictions on entry to particular sectors. Any moves to curtail these freedoms under future WTO investment negotiations should be strenuously resisted by developing countries.[73]

Fifth, FDI must be seen as just one part of an overall, domestic development strategy, focussed on building local capacities and domestic investment. Where FDI can contribute to this strategy and improve overall social welfare, it should be welcomed. But it should not be pursued to the detriment of these primary goals.

Sixth, escalating incentives to attract FDI is ultimately a zero-sum game for governments, diverting government revenues and energies into subsidising TNCs. Developing countries cannot hope to match the resources of the wealthy OECD countries and since the marginal value of government resources are arguably more valuable for them, they should resist trying to do so. Multilateral approaches must be found to curb this harmful competition.

Finally, voluntary corporate codes of conduct vary enormously in what they include, what they leave out, and whether any independent monitoring or enforcement takes place. They therefore vary accordingly in how useful they are. Well-crafted and well-monitored codes of conduct can be a useful adjunct in a sound political and legal environment to help 'raise the bar' of corporate behaviour. They can also be useful in encouraging responsible TNC behaviour in a less than ideal political and legal environment. But they should in no way be used to forestall the development and enforcement of sound environmental, social and labour laws. Neither should they be used to mask the need for a sound economic and social cost-benefit analysis of proposed investments.

Just because a company has a wonderful, well-monitored and well-enforced code of conduct, doesn't automatically mean its investment is going to make a given developing country or region better off. The cost-benefit analysis needs to be undertaken. It might well reinforce the case for a particular investment or even the opening up of an entire sector. But then again, it might not. It might show that a country is better off restricting some types of investments and imposing performance requirements on others.

In light of these issues, World Vision does not support the launching of negotiations on investment in the WTO. An international investment agreement negotiated under the WTO would most likely reduce the flexibility of developing country governments to restrict certain types of investment and would make it more difficult for governments to impose on companies the kinds of performance requirements that may be necessary to make the investment a net benefit for the country.

[73] For a good discussion of proposals on investment under the WTO from a developing country perspective, see Singh (2001).

7. Trade, Diversification and the Role of Aid

7.1 Aid, Transaction Costs and Development

Over the last 30 years, the role of aid in assisting developing countries has been gradually downplayed by many donor governments. They have increasingly emphasised trade and foreign investment while cutting their aid budgets. The Australian Minister for Foreign Affairs, Mr Alexander Downer, for example, expounded this view in October 2002 during his Menzies Lecture in Melbourne, saying that trade was the main game and that "aid … can only help at the margins" (Parkinson, 2002). Not coincidentally, Australia has halved the proportion of its gross national income (GNI) that it gives in official development assistance (ODA) from 0.5% in the early 1970s to 0.25% today. Australia is not alone in its declining generosity however. There have been some encouraging increases in recent years, and some countries are pulling their weight and making significant aid contributions but several other OECD countries have cut their aid contributions. The rankings of aid contributions per capita in Appendix 6 show a wide disparity in countries' generosity. It should be pointed out however that some European countries, who like to boast of their aid levels, are also ardent supporters of an agricultural trade policy regime which impoverishes millions.

The 'trade not aid' mantra is strangely out of touch with what is required for economic development and the expansion of trade itself in poor countries. It underlies the push for blanket liberalisation in the WTO and the cuts to many country's aid budgets, but the slogan rests on a misleading dichotomy that has more to do with fiscal and political expediency and economic vested interests in OECD countries than sound development principles. The false dichotomy lies at the core of many of the intractable problems of WTO negotiations and inappropriate World Bank and IMF conditionalities. The call on the poor to trade their way to prosperity ignores the question of how such states can build the capacity for successful trade without substantially more aid than the rich world is currently willing to provide.

The over-emphasis of trade and marginalisation of aid also dovetails suspiciously neatly with a general political shift to the right in many OECD countries over the past 30 years. A neo-liberal ideology which violates many of the precepts of sound economics, took root in the 1980s with disastrous consequences for the poor, who suffered under frequently misguided structural adjustment programmes.

As discussed in earlier chapters, advice to developing countries to liberalise their trade regimes no matter what their circumstances and to rely on 'trade not aid' usually ignores the fact that comparative advantage is dynamic and can be intentionally acquired through policies to promote investment, learning and productivity growth in new fields. That is not to say that liberalisation is never appropriate - far from it. But whether liberalisation is the best policy option must be grounded in detailed studies of individual countries' capacities and options. This is why the choice of the analytical framework discussed in Chapter 2 is so important.

Along with general macroeconomic stability, three factors are of critical importance for any country wishing to pursue a strategy of diversification: decent infrastructure, good human capital and sound institutions. Each of these plays a major role in determining the overall level of transaction costs in a country's economy, and these costs significantly constrain its scope for development and diversification.

In *The Wealth of Nations*, Adam Smith (1776), argued that a country's degree of specialisation among its citizens - its division of labour - depended on the size of its market. Allyn Young (1928) noted that while Smith's observations were true, the size of a country's market was itself determined by its

division of labour, since the productivity boost which comes with a greater division of labour increases income, which effectively also increases the size of the market.

Xiaokai Yang (2001, 2003) from Monash University, has developed a sophisticated 'inframarginal' approach to economic analysis which integrates Smith's and Young's insights, placing transaction costs at the core.[74] Yang argues that transaction costs limit the size of the market. A smaller market limits the division of labour, and this in turn limits development and the growth of productivity and incomes. There is therefore a trade-off between transaction costs and the network effects of the division of labour. A country crippled by high transaction costs due to poor infrastructure and institutions, is also severely limited in its division of labour. So poor infrastructure, a small market and low levels of human capital and specialisation are mutually reinforcing problems which can trap a country in poverty. Aid can play an important role in strengthening all three capacities and for this reason the links between aid and trade are of fundamental importance.

7.2 Infrastructure

The need for adequate infrastructure to facilitate economic development, export diversification and poverty reduction is self-evident. Market opportunities are limited without roads and rail services, and rural roads can be an important factor in reducing poverty (van der Walle, 2002). Production and transactions are hindered with inadequate or unreliable power and water supplies and telecommunications, and trade is stifled with poor quality and inefficient port facilities.

The same infrastructure that is needed to facilitate economic activity is also essential for strengthening institutions and building human capital. Governance, education and health services all suffer when transport links are poor and power and water are unreliable.

7.3 Human Capital

A skilled and healthy workforce is essential for development and the adoption of new technology (Mayer 2000, 2001). As discussed in Chapter 5, this precondition was an important factor in Taiwan's and Korea's subsequent success. Without adequate investments in education, especially for women (Schultz, 2002), there is a real danger that countries can become enmeshed in a low-skills, low-quality trap. Redding (1996) used a model of endogenous growth to analyse the relationship between investments in human capital and R&D, arguing that the two types of investment are strategic complements. He shows that far from a unique equilibrium being established, multiple equilibria are possible, and an economy can become trapped in a 'low-skills' equilibrium, with a poorly trained workforce and low product quality. He concludes that in the presence of such possible multiple equilibria, there may be a welfare-improving role for government policy in coordinating expectations.

Owens and Wood (1997) also show that just such a trap is possible and may prevent diversification into more value-added processed food exports. Using a cross-country econometric approach, they argue that for countries with moderately skilled workforces, such as in Latin America, such diversification is possible, but not for countries with very low skill levels, as in much of Sub-Saharan Africa. Stiglitz (1987) moreover, notes that learning itself is a skill that may need to be learned. When people don't know what they don't know, they may not even feel the need for investments in learning and technological upgrading.

[74] Yang's work has been hailed by Nobel Prize winner James Buchanan as some of "the best research in economics in the world", and in his forward to Yang's (2003) book Jeffrey Sachs described Yang as "one of the world's most penetrating and exacting economic theorists, and one of the most creative minds in the economics profession" (p. xvii). For more see Yang and Ng (1993) and: www.inframarginal.com

Health is the other major factor influencing the quality of the workforce. To take just three examples, Gallup and Sachs (2001) showed that controlling for factors such as tropical location, colonial history, and geographical isolation, countries with intensive malaria in 1995 had only 33% of the income levels of countries without malaria, whether or not the countries were in Africa. Using cross-country regressions for the 1965-90 period they found that countries with intensive malaria grew 1.3% less per person per year, and a 10% reduction in malaria was associated with 0.3% higher growth. HIV/AIDS is devastating Sub-Saharan Africa and many countries in Asia, and diarrhoea from dirty water continues to be the second biggest killer of children under five (WHO, 1998). Investments in health, sanitation and a major international effort on 'neglected' diseases such as malaria, and on HIV/AIDS treatment and prevention would bring enormous benefits to developing countries, significantly improving the quality of their workforces.

Again, aid to improve educational and skill levels, sanitation and health is essential for helping the poorest countries to build the skilled workforces needed to diversify their economic and export bases and build 'capacity for development' (see Fukada-Parr *et al.*, 2002). The WHO's 18-member Commission on Macroeconomics and Health (CMH) – which worked for two years under the direction of professor Jeffrey Sachs, found for example that an extra investment of $66 billion in health each year in developing countries would save eight million lives per year and would pump an extra $360 billion into the world economy (Sachs, 2001).

7.4 Institutions

Many authors have emphasised the primary importance of quality government institutions and policies in the process of economic diversification and technological development (eg. Clague, 1997; Clague *et al.* 1997; Clarke, 2002; Knack and Keefer, 1995, 1997; Lall, 1992, 1994, 1996a; North, 1990, 1991, 1994, 1998; Amsden, 2001; Ranis, 1989; Rodrik 1999a, 2002, World Bank, 2002). Recently Rodrik *et al.* (2002) demonstrated that the quality of its institutions is more important for a country's development than either geography or its degree of integration into the global economy. This echoes Hall and Jones' (1999) finding that institutions were more important for explaining economic growth than either physical capital per worker or educational attainment.

Japan, Korea and Taiwan had the advantage of a very good educational base and economic ministries which were regarded as elite institutions, attracting the highest calibre students from the top universities. Such conditions do not apply in much of the developing world - particularly in Sub-Saharan Africa. Amsden (2001) emphasises a key difference in the way in which industry policy was implemented in East Asia, compared with Latin America. In Taiwan and Korea, the state ensured that nothing was given to businesses for nothing. A strong 'reciprocal control mechanism' ensured that time-limited domestic market protection and subsidised credit in Korea and Taiwan were given only in exchange for export commitments, quality upgrading, technological investments and so on. In many countries in Latin America where a diversification strategy was tried, particularly in Argentina, no such control mechanism existed. Protection was given in an unsystematic way with no export requirements, resulting in bloated and inefficient, and inward looking industries.

The design of appropriate export diversification strategies must take into account the quality of local institutions. Policies designed to be implemented by highly educated and competent Platonic philosopher-kings are hardly likely to be appropriate for inept kleptocracies. Analysis of local institutions must therefore be central to any discussion of diversification strategies. Such a strategy is likely to work best in countries that are already making the most of their current natural comparative advantages. This of course will not be the case in some countries where institutional, infrastructural and educational bottlenecks hamper even the most basic developmental goals.

In his widely acclaimed book *The Mystery of Capital*, Peruvian economist Hernando De Soto (2000) gives many examples of dysfunctional institutional arrangements in developing countries that hinder

economic development and trade. For example, it took his research team 289 days working six hours a day to legally register a small one-person garment workshop in Lima at a cost of US$1231, thirty-one times the monthly minimum wage (p. 18). Legal and institutional reform is an urgent priority in many countries. Aid again can play an important role in institutional support, reform and development.

Advocates of the 'trade not aid' view often have little appreciation for the costs involved in participating in the WTO system.[75] Many of the poorest WTO members do not even have representatives in Geneva because of the costs involved. This puts them at a severe disadvantage in trade negotiations. There is some aid for technical assistance to assist these countries and train officials but not enough - and often the training is of a strictly neoclassical flavour.

Implementing WTO agreements can also be enormously costly. Finger and Schuler (1999) point out, for example, that the costs involved in purchasing equipment, training people, establishing systems of checks and balances, strengthening institutions, administrative and monitoring capacities are substantial. Based on World Bank project experience in the areas covered by the agreements, they noted that an entire year's development budget was at stake in many of the LDCs. For example:

> To gain acceptance for its meat, vegetables and fruits in industrial country markets, Argentina spent over $80 million to achieve higher levels of plant and animal sanitation. Hungary spent over $40 million to upgrade the level of sanitation of its slaughterhouses alone. Mexico spent over $30 million to upgrade intellectual property laws and enforcement that began at a higher level than are in place in most least developed countries; customs reform projects can easily cost $20 million. Those figures, for just three of the six Uruguay Round Agreements that involve restructuring of domestic regulations, come to $130 million … more than the annual development budget for seven of the twelve least developed countries for which we could find a figure for that part of the budget. (Finger and Schuler, 1999, p. 25)

Institutions specifically focused on helping countries to develop and adopt new technologies, better packaging, more effective management techniques and higher quality standards are essential for diversifying exports. These institutions include universities, research institutes, national systems of innovation, extension services and professional associations (Freeman, 1995; Lundvall *et al*., 2002; Nelson, 1986; Nelson and Nelson 2002). Currently however, many such institutions in developing countries are totally ineffective because of under-funding, demotivated and poorly-paid staff, obsolete equipment and unclear objectives (Lall, 2001). Reform and upgrading is urgently needed, but reform takes resources and trained staff which many countries do not have.

Another extremely important role for institutions is in managing the conflicts in societies that are inevitable during processes of structural change - not least through good regulations, an independent judiciary, and well functioning courts (Chang, 1994). Collier and Hoeffler (2002) found that aid can be exceptionally effective in reducing the risks of further conflict in post-conflict societies.

Good governance and sound institutions are essential but most LDCs simply do not have the money to develop them. Government officials are often chronically underpaid, which encourages corruption and loss of competent staff (Godfrey *et al.* 2002). It costs money and takes time to build ports and roads, strengthen the rule of law, reform the police and army, fight corruption, train a healthy, skilled workforce, build institutions, raise technical, sanitary and phytosanitary standards and upgrade production facilities. But, according to UNCTAD (2002c, p. 4) between 1995 and 1999, the average per capita income in the LDCs was $0.72 a day and the average per capita consumption, $0.57 a day, leaving "an average $0.15 per person per day to spend on private capital formation, public investment in infrastructure and the running of vital public services, including health, education, administration and law and order".

[75] See OECD (2001) for a good overview of some of the issues involved in strengthening developing countries' trade capacities.

Aid can therefore have an extremely important role in providing the resources needed to strengthen vital institutions. This is one of the most difficult developmental tasks and success so far has been mixed, but there are a growing number of successful case studies (Tarp and Hjertholm, 2000).

7.5 Aid and Trade for Poverty Reduction

The debate in the economic literature on aid effectiveness was sharpened considerably by Burnside and Dollar's (2000) study arguing that aid was effective, but only in the context of 'good' policies. In its earlier incarnation as a 1997 World Bank Working Paper, this study heavily influenced the policy recommendations of the World Bank's 1998 report *Assessing Aid: What Works, What Doesn't and Why*. The policy implications are considerable, since the paper, the World Bank report, and studies deriving from it (eg. Collier and Dollar, 2001 and 2002) urged donors to focus aid only on countries with 'good' policies.

Burnside and Dollar's results have been shown to be surprisingly fragile however. Hansen and Tarp (2000, 2001), Dalgaard and Hansen (2001) and Dalgaard, Hansen and Tarp (2002) have shown that Burnside and Dollar's econometric evidence on the aid and growth relationship is not robust to variations in the sample data or estimation techniques and there are substantial problems with their index of 'good policy' - which among other things, bore a striking resemblance to the then-prevailing 'Washington consensus'. Burnside and Dollar also do not directly test for the effectiveness of aid against its primary purposes, namely poverty reduction and development. They apparently assume instead that growth equals development. But as the results in Chapter 3 of this report show, there can be quite different results for growth and poverty measures for the same set of regressors.

More disturbingly, Burnside and Dollar do not appear consider the likely long-term consequences for the poor of withdrawing support from countries with allegedly 'bad' policies. This point was reinforced recently from what some would consider an unlikely quarter, by Stanley Fischer, First Deputy Managing Director of the IMF from 1994 to 2001 and now President of Citigroup International. In his Richard T. Ely lecture to the American Economic Association in January 2003, Fischer (2003, p. 22) observed that:

> [W]hen aid to a country with bad government is cut off, most of those who suffer are private citizens, who are already suffering from poor government. Hence humanitarian aid generally does and should continue in such cases, like Zimbabwe, where the humanitarian crisis is caused by the actions of the government. Jeffrey Sachs and others … have made a powerful case that the very poorest countries should receive large amounts of aid, to enable them to improve health, education, and infrastructure, as part of an effort to jump-start development.

The needs of children are crucial to bear in mind here. They only get one shot at receiving a decent education and growing up mentally and physically healthy. Every generation of children allowed to grow up malnourished, poorly educated and traumatised by violence puts their country further and further behind. No amount of economic tinkering later on can make up for those lost years. Preventing such a tragic and avoidable waste of human potential through substantial increases in aid to poor countries should be an urgent priority.

Burnside and Dollar's strong policy conclusion, echoed in the World Bank's (1998) *Assessing Aid* report therefore appears to be both surprisingly fragile and somewhat misguided. Moreover, Hermes and Lensink (2001) seem to be right in observing that far from offering a 'new paradigm' for aid allocations, the Bank's 'good governance' criterion is in fact reintroducing old-style conditionality "in disguise" (p. 14).

This is not to say of course that policies are unimportant for aid effectiveness. Rather it reflects the fact that aid influences both growth and poverty outcomes through a variety of channels and there

are likely to be complex interactions with a number of macroeconomic and social variables. The endogeneity of aid makes model specification and interpretation of aid regression results particularly difficult. There is a great deal of scope for future work on this issue.

None of the foregoing should be read as implying that there are no problems with aid effectiveness, corruption, or the design and delivery of aid programs. There are. But there are also a vast number of documented cases of extremely effective aid programmes, particularly as donors focus more on eradicating poverty rather than on cold-war strategic interests. The 'trade not aid' mantra is therefore a misguided, false dichotomy. There are multiple linkages between aid, economic development, export diversification, growth and poverty reduction. Developing countries can gain from diversifying their export bases and upgrading their technological production capacities. But this requires decent infrastructure, a good human capital base and well functioning institutions. Significant increases in aid are required to help developing countries to achieve these goals.

8. Conclusions

A variety of approaches are needed to study the dynamics of growth, learning, poverty reduction firm-government interaction and the acquisition of comparative advantages in new areas. Formal models and econometric studies of the kind discussed in this report can be of great assistance. But to capture the richness of these processes in different contexts, detailed country-specific studies are also required.

Many of these studies as well as the econometric evidence presented here, have shown that the types of products a country exports matters for its long-run development. A more diversified export base and a higher proportion of manufactured exports tends to be associated with lower terms of trade and export price volatility and a range of improved poverty outcomes. This does not mean that countries should promote manufacturing in a way that harms the rural sector. Nor does it mean that developing countries should turn their backs on their current strengths, be they in mining or agriculture. As the World Bank study by de Ferranti *et al.* (2002) showed, careful management of traditional sectors along with greater value-added processing where possible, can be of significant benefit and can help provide the resources needed for appropriate diversification.

The econometric evidence presented here, and the experience of countries such as Korea and Taiwan still suggest however, that manufacturing probably offers the greatest combined potential for linkages to the rest of the economy, technological deepening, strengthening of the terms of trade, and poverty reduction. Mayer (2002) *et al.* studied the most dynamic products in world exports, as judged by values and market shares between 1980 and 1998 - roughly the same period as the dataset used in Chapter 3 of this report. They found that the most dynamic products were electronic and electrical goods including their parts and components, goods requiring high R&D expenditures, and labour-intensive products, particularly clothing.

WTO agreements and conditionalities tied to loans or grants that require countries to liberalise their trade regimes or open particular sectors to foreign investment regardless of the consequences for particular sectors and industries, are unlikely to be in the best interests of the country concerned. Policy advice and aid conditionalities for individual countries should be based on detailed studies of the local economy and society, its institutions and its history, and should be grounded in a deep understanding of the interactions between poverty reduction, human capital development, technological innovation and economic growth.

Above all, WTO agreements and aid conditionalities must take into account their effects on women and children, who are generally the most vulnerable to economic shocks. Substantial increases in aid are urgently needed for children in particular, to prevent yet another generation growing up malnourished, poorly educated and traumatised by violence. Only then will their countries be able to participate on an equal footing in the world trading system.

Appendix 1: Regression Results

Introductory Notes

Ordinary Least Squares (OLS) regressions test a model of the general form:

$Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \ldots + \beta_n X_n + \varepsilon_i,$

where Y is the dependent variable
α is the constant
X_i is an independent variable out of a set of variables running from X_1 to X_n
β_i is the coefficient on the specific independent variable X_i
and ε_i are the errors.

In the tables that follow, the dependent variable is listed in the top left corner and the independent variables are listed in the first column. Regressions are numbered for each table and should be read as a column. Not every variable listed in column 1 is included in each regression. In fact, the tables are presented in such a way as to show a number of different regressions for the independent variable. This enables the robustness of the regression to different specifications to be tested. The type of regression is listed at the top of each column. There are five possibilities (see text for explanations):

RE: Random Effects regression
RE-AR: Random Effects regression allowing for autocorrelation
FE: Fixed Effects regression
FE-AR: Fixed Effects regression allowing for autocorrelation
OLS: Ordinary Least Squares regression. Note the OLS regressions are undertaken using robust standard errors (after White, 1980).

One or both of two superscripts may also be present at the top of each column:
* Indicates that the regression is evaluated in Table 3 of Chapter 3.
N Indicates that there is an explanatory note concerning the regression at the end of these introductory notes.

The numbers in parentheses under each coefficient indicate the level of significance and mean different things for each type of regression:
RE: (absolute value of z statistics)
FE: (absolute values of t-statistics)
OLS: (absolute values of t-statistics using robust standard errors).

The asterisks on the coefficients give a more visually obvious indication of significance:
*significant at 10%; ** significant at 5%; *** significant at 1%

Obs: The number of observations used in the regression. It will vary depending on data availability for the particular model being evaluated.

Countries: The number of countries used in the regression. It will also vary depending on data availability for the particular model being evaluated.

R-Squared: A measure of 'goodness of fit' - specifically it is a measure of how much of the variation in the dependent variable is explained by the model. It is not reported for RE regressions since it is not well defined in such cases.

Wooldridge: Reports the p-value for the Wooldridge test of serial correlation in the regressors. A p-value over 0.05 means the null hypothesis of no first order serial correlation cannot be rejected.

BP: Reports p-value of Chi-squared test statistic for Breusch-Pagan Lagrangian multiplier test for Ho: Var(ν)=0. Values under 0.05 indicate *rejection* of Ho at 95% significance level and that OLS is inappropriate.

Hausman: Reports p-value of Chi-squared test statistic for Hausman test for Ho: Difference in coefficients between RE and FE regressions is not systematic. Values over 0.05 indicate a failure to reject of Ho at 95% significance level and therefore a preference for RE model. . When both BP and Hausman are over 0.05, OLS with robust standard errors is used. HF (Hausman Failure) indicates that the model fitted on these data fails to meet the asymptotic assumptions of the Hausman test. When regressions containing regional dummy variables produce HFs, RE regressions are reported since FE ignores variables which do not change with time.

RE Wald-o: Reports the p-value of the Wald test for joint insignificance of the regressors. A p-value below 0.05 means the null hypothesis of joint insignificance can be rejected at the 95% level.

FE F-test-o: Reports the p-value of the F-test on FE regressions for overall joint insignificance of the regressors. A p-value below 0.05 means the null hypothesis of joint insignificance can be rejected at the 95% level.

FE F-test-i: Reports the p-value of the F-test on FE regressions for overall joint insignificance of the regressors. A p-value below 0.05 means the null hypothesis of joint insignificance can be rejected at the 95% level.

ν_i Fraction: Reports the fraction of the variance due to the individual effects, ν_i

rho: For an AR regression, *rho* reports the overall autocorrelation coefficient.

DW: For an AR regression, DW reports the modified Durbin-Watson statistic after Bhargava *et al* (1982).

sktest: Reports the p-value of the Skewness-Kurtosis test for normality of the residuals of the regression as described by D'Agostino *et al.* (1990) and adjusted by Royston (1991). A p-value over 0.05 means the null hypothesis of normally distributed residuals cannot be rejected.

swilk: Reports the p-value of the Shapiro-Wilk test for normality of the residuals of the regression as described by Shapiro and Wilk (1965) and adjusted by Royston (1982, 1992, 1993). A p-value over 0.05 means the null hypothesis of normally distributed residuals cannot be rejected.

Wooldridge-r: Reports the p-value for the Wooldridge test of serial correlation in the residuals. A p-value over 0.05 means the null hypothesis of no first order serial correlation cannot be rejected.

Note: The table below each regression gives not only the tests applicable to that particular regression, but also, unless it is an OLS regression, it gives the tests for the alternative regression estimation which was not reported. So if a regression is a FE regression, the corresponding Wald test for the RE regression is also given, even though the RE regression itself it not reported. Likewise, for an RE regression, the F-tests of the FE regression are (usually) given. Sometimes the statistics of the non-reported regressions are omitted when all tests are extremely clear about which estimation technique is preferable.

The Breusch-Pagan Test

The Breusch-Pagan (1980) Lagrange multiplier test is a commonly used formal test for the *absence* of unobserved cross-section specific effects. The test is based on the OLS residuals, to see if estimation by OLS is appropriate. In a large cross-country data set, we would expect that most of the variation would be between countries rather than within countries, so it is essential for regressions to be tested in this way.

First an RE model is estimated. Then the test is applied with the null hypothesis, H_o: $\sigma_v^2 = 0$, against the alternative H_A: $\sigma_v^2 \neq 0$, where $\sigma_v^2 = E(v_i^2)$, the unconditional variance across *t*.

Note that under the null, the RE estimator reduces to the OLS estimator, since if $\sigma_v^2 = 0$, then

$$\boldsymbol{\Omega} = \begin{bmatrix} \sigma_v^2 + \sigma_\varepsilon^2 & \sigma_v^2 & \cdots & \sigma_v^2 \\ \sigma_v^2 & \sigma_v^2 + \sigma_\varepsilon^2 & \cdots & \vdots \\ \vdots & & \ddots & \sigma_v^2 \\ \sigma_v^2 & \cdots & & \sigma_v^2 + \sigma_\varepsilon^2 \end{bmatrix} \text{ becomes simply: } \boldsymbol{\Omega} = \begin{bmatrix} \sigma_\varepsilon^2 & 0 & \cdots & 0 \\ 0 & \sigma_\varepsilon^2 & \cdots & \vdots \\ \vdots & & \ddots & 0 \\ 0 & \cdots & & \sigma_\varepsilon^2 \end{bmatrix}$$

The test statistic devised by Breusch and Pagan is calculated as:

$$LM = \frac{NT}{2(T-1)} \left[\frac{\sum_{i=1}^{N} \left(\sum_{t=1}^{T} \hat{\varepsilon}_{it} \right)^2}{\sum_{i=1}^{N} \sum_{t=1}^{T} \hat{\varepsilon}_{it}^2} - 1 \right]^2 \sim \chi_1^2$$

where $\sum_{i=1}^{N} \sum_{t=1}^{T} \varepsilon_{it}^2$ is simply the sum of squared residuals from the OLS regression.

Under the null hypothesis, *LM* has a χ^2 distribution with one degree of freedom. A modification developed by Baltagi and Li (1990) was used which allows for data with missing values (Sata Corp, 2002, p. 210).

If the null is rejected (the calculated statistic is greater than the critical value), it means that there are cross-section specific effects, i.e. $\sigma_v^2 \neq 0$, which means that classical OLS is inappropriate and the RE or FE panel estimators should be used instead.

The Hausman Test

The Hausman (1978) test allows us to compare the appropriateness of the FE and RE estimators for a particular regression. The most important consideration in deciding between a FE and RE estimator is whether ν_i and $\mathbf{x}_{it}$ are correlated. The key relevant assumptions for the FE estimator are:

Strict exogeneity: $E(\varepsilon_t \mid \mathbf{x}_i, \nu_i) = 0$, $t = 1, \ldots\ldots T.$, so $E(\nu_i \varepsilon_{it}) = 0$

However for the FE estimator, orthogonality between ν_i and each $\mathbf{x}_i$: $E(\nu_i \mid \mathbf{x}_i) = E(\nu_i) = 0$ is not assumed. This means that for FE analysis $E(\nu_i \mid \mathbf{x}_i)$ can be any function of $\mathbf{x}_i$. As Wooldridge (2002, p. 288) notes, since the FE is consistent when ν_i and $\mathbf{x}_{it}$ are correlated, but the RE is *inconsistent*, a statistically significant difference between the estimations may be interpreted as evidence against the orthogonality between ν_i and each $\mathbf{x}_i$: $E(\nu_i \mid \mathbf{x}_i) = E(\nu_i) = 0$. The hypotheses then are:

H_o: $E(\nu_i \mid \mathbf{x}_i) = 0$, the RE GLS estimator is consistent and the *within*, or FE, estimator is consistent but inefficient. Under the null, the two estimates should not differ significantly.

H_A: $E(\nu_i \mid \mathbf{x}_i) \neq 0$, the RE GLS estimator is *inconsistent* and the *within*, or FE, estimator is consistent.

If $\hat{\delta}_{RE}$ is the vector of random effects estimates without the time-constant coefficients, and $\hat{\delta}_{FE}$ is the vector of fixed effects estimates without the time-constant coefficients or the constant, and these are M x 1 vectors, then the Hausman statistic *Hausman* is calculated as:

$$Hausman = (\hat{\delta}_{FE} - \hat{\delta}_{RE})'[Var(\hat{\delta}_{FE}) - Var(\hat{\delta}_{RE})]^{-1}(\hat{\delta}_{FE} - \hat{\delta}_{RE})$$

Hausman has a χ^2_M asymptotic distribution under the above assumptions. If the null is *rejected*, it means there is correlation between the individual effects and the explanatory variables, so $E(\nu_i \mid \mathbf{x}_i) \neq 0$ and FE is to be preferred over RE.

Notes on Specific Regressions

A1.4 GDP per capita growth.
Regression 1c is to be preferred out of 1a, b, and c since while the FE regressions give good F-tests the Hausman test is close to being unable to be rejected and the FE does not give a sensible result for the effects of female adult illiteracy on growth given what we know of the importance of human capital. Moreover, the BP test is overwhelmingly unable to be rejected so in this case OLS seems preferable. Still, the choice is borderline and the result for LEXCONC is obviously sensitive to the choice of estimation technique. Regression 2b was chosen for evaluation in Table 3 over the FE regression 2a because the BP test was not rejected and the OLS regression gives a more sensible result for the effect of female illiteracy on growth, as well as having normally distributed residuals, unlike the FE regression. Regression 4b: HF: $\chi^2(25) = -17.94$, so the Hausman test for 4a, suggesting use of RE, was used as a guide.

A1.7 Immunisation against Measles
Regressions 2a,b: HF: $\chi^2(14) = -1.62$ so both FE and RE regressions are presented. The FE regression 2b was chosen for evaluation in Table 3 because it gave the most conservative estimate and because its residuals were normally distributed.

A1.8 Immunisation against DPT

Regressions 3a,b: HF: $\chi^2(14)= -356.06$, so both FE and RE regressions are presented. The FE regression 3b was chosen for evaluation in Table 3 because its F-tests are good and the individual effects v_i explain 93% of the variation.

A1.11 Female youth illiteracy

Regressions 4a,b: The OLS regression is evaluated in Table 3 because the overall F-test for the FE regression (FE-test-o) shows the regressors to be jointly insignificant and the BP test can not be rejected, indicating that OLS is a reasonable alternative.

A1.12 Malnutrition (by height)

Regression 4: FE is presented because while the Hausman test favours RE, the Breusch-Pagan test cannot reject OLS. Yet the FE is preferred to OLS because the F-tests show it to be significant and the individual effects v_i are significant, explaining over 90% of the variance.

A1.13 Malnutrition (by weight)

Regression 4: OLS was chosen because while the Hausman test suggests FE, the overall F-test-o for FE says that the null hypothesis of nothing in the FE regression being significant can not be rejected.

A1.14 Low Birth-weight Babies

Regressions 3a,b: OLS is recorded as well since the F-test-o for the FE regression is so dismal and the BP test is close to rejection.

Regressions 4a,b: OLS is recorded as well since the F-test-o for the FE regression is so dismal and the BP test is rejected.

A1.1 Terms of Trade Volatility

ltotvol	*(1)* RE	*(2)* RE	*(3)* RE*	*(4)* RE	*(5)* RE	*(6)* RE*
Constant	3.975***	4.237***	4.334***	3.056**	3.563**	4.512***
	(5.33)	(4.05)	(4.10)	(2.45)	(2.44)	(3.07)
lgdpperc99	0.145*	0.056	-0.021	0.203*	0.057	-0.043
	(1.79)	(0.53)	(0.19)	(1.96)	(0.45)	(0.33)
llagm2	0.030	0.034	0.007	0.189	0.178	0.098
	(0.21)	(0.21)	(0.04)	(0.99)	(0.84)	(0.47)
srkform	-0.137	-0.170	-0.151	-0.227*	-0.283**	-0.297**
	(1.43)	(1.58)	(1.32)	(1.90)	(2.17)	(2.19)
fdi	-0.055*	-0.059*	-0.048	-0.053	-0.058	-0.041
	(1.85)	(1.89)	(1.49)	(1.52)	(1.63)	(1.10)
linfln	0.183	0.181	0.210	0.056	0.043	0.120
	(1.00)	(0.97)	(1.12)	(0.30)	(0.24)	(0.65)
budgbal	-0.019	-0.023	-0.007	-0.033**	-0.032**	-0.009
	(1.24)	(1.46)	(0.38)	(2.17)	(2.05)	(0.49)
lexpcgdp	-0.378***	-0.326**	-0.265*	-0.281*	-0.098	-0.138
	(2.69)	(2.13)	(1.73)	(1.80)	(0.58)	(0.82)
srimtax	-0.032	0.011	-0.036	0.007	0.064	-0.001
	(0.49)	(0.16)	(0.51)	(0.09)	(0.78)	(0.01)
rule	0.048	0.064	0.098	0.030	0.046	0.072
	(0.82)	(1.07)	(1.47)	(0.47)	(0.70)	(1.00)
burq	-0.049	-0.013	-0.012	-0.050	0.018	0.018
	(0.65)	(0.16)	(0.15)	(0.59)	(0.20)	(0.21)
corr	-0.006	-0.029	-0.005	-0.008	-0.028	0.013
	(0.09)	(0.42)	(0.07)	(0.10)	(0.36)	(0.16)
ethtens	-0.104**	-0.109**	-0.092*	-0.079	-0.086	-0.083
	(2.31)	(2.31)	(1.90)	(1.46)	(1.56)	(1.48)
lexconc	0.607***	0.640***	0.505***			
	(4.60)	(4.53)	(3.45)			
lagrawex				0.000	0.015	0.040
				(0.00)	(0.26)	(0.67)
lfoodex				0.054	0.021	-0.066
				(0.52)	(0.19)	(0.59)
lfuelex				0.052	0.047	0.047
				(1.58)	(1.43)	(1.42)
lmanfex				-0.266***	-0.322***	-0.218**
				(3.72)	(3.86)	(2.47)
lmetalex				-0.021	-0.003	-0.018
				(0.51)	(0.06)	(0.43)
linfinsvex				-0.001	-0.012	-0.010
				(0.03)	(0.27)	(0.23)
ltransvex				-0.122	-0.099	-0.039
				(1.09)	(0.88)	(0.33)
ltravsvex				-0.102	-0.136	-0.103
				(1.25)	(1.56)	(1.20)
eap		0.385	0.125		0.260	0.056
		(1.37)	(0.42)		(0.74)	(0.16)
lac		0.323	0.264		0.437	0.407
		(1.24)	(1.00)		(1.37)	(1.28)
sa		0.075	0.108		0.297	0.170
		(0.23)	(0.32)		(0.72)	(0.41)
ssa		-0.094	-0.101		-0.406	-0.374
		(0.31)	(0.33)		(1.09)	(0.99)
d01			0.253			0.312
			(1.42)			(1.52)
d02			0.352**			0.360*
			(2.21)			(1.85)
d03			0.046			-0.059
			(0.28)			(0.29)
d04			-0.123			-0.148
			(0.94)			(0.96)
Obs	182	182	182	155	155	155
Countries	52	52	52	47	47	47
Wooldridge	0.1878	0.1878	0.5986	0.0396	0.0396	0.1672
RE Wald-o	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
v_i Fraction	0.3069	0.3334	0.3794	0.3983	0.3666	0.3938
BP	0.0000	0.0001	0.0000	0.0036	0.0189	0.0055
Hausman	0.2132	0.3938	0.1354	0.8547	0.9423	0.7909
sktest	0.6451	0.6970	0.7351	0.9000	0.8458	0.5437
swilk	0.7502	0.8128	0.9245	0.5696	0.8317	0.4981
Wooldridge-r	0.2563	0.2438	0.4465	0.3721	0.3896	0.8716

A1.2 Change in the Terms of Trade

dtot	*(1)* OLS	*(2) OLS*	*(3) OLS*	*(4)* OLS	*(5)* OLS	*(6)* OLS
Constant	7.922	3.713	3.762	8.398	-0.525	-2.867
	(1.16)	(0.41)	(0.45)	(0.92)	(0.05)	(0.31)
lgdpperc99	-1.763***	-0.965	-0.183	-1.962***	-1.640*	-1.235
	(2.91)	(1.47)	(0.27)	(2.90)	(1.75)	(1.38)
llagm2	0.113	0.030	0.657	-4.251***	-2.866*	-2.469
	(0.09)	(0.02)	(0.42)	(2.86)	(1.70)	(1.47)
srkform	-0.835	-0.310	-0.921	-0.114	0.963	0.514
	(1.05)	(0.26)	(0.85)	(0.12)	(0.86)	(0.44)
fdi	0.071	0.066	-0.055	0.274	0.123	-0.015
	(0.24)	(0.20)	(0.18)	(0.73)	(0.34)	(0.04)
linfln	0.577	0.639	1.023	1.033	0.857	1.443
	(0.28)	(0.31)	(0.54)	(0.53)	(0.43)	(0.85)
budgbal	0.078	0.137	0.051	0.192	0.300	0.248
	(0.46)	(0.72)	(0.25)	(0.81)	(1.11)	(0.85)
lexpcgdp	0.765	0.512	0.319	1.690	1.447	2.289
	(0.55)	(0.28)	(0.17)	(1.49)	(1.02)	(1.51)
srimtax	-0.308	-0.771	-0.357	-0.065	-0.616	-0.069
	(0.41)	(0.90)	(0.42)	(0.10)	(0.80)	(0.09)
rule	-0.259	-0.375	-1.111**	0.139	-0.096	-0.743
	(0.44)	(0.66)	(2.08)	(0.23)	(0.15)	(0.93)
burq	0.572	0.101	0.195	0.529	0.379	0.843
	(1.21)	(0.21)	(0.36)	(0.95)	(0.56)	(1.16)
corr	0.402	0.588	0.596	-0.271	0.020	-0.266
	(0.75)	(1.14)	(1.09)	(0.51)	(0.04)	(0.48)
ethtens	0.543	0.690*	0.357	0.728	0.799	0.629
	(1.32)	(1.85)	(0.87)	(1.56)	(1.38)	(1.01)
lexconc	-1.272	-1.572	-0.613			
	(0.96)	(1.07)	(0.41)			
lagrawex				0.323	0.299	0.276
				(0.69)	(0.67)	(0.60)
lfoodex				-0.404	0.033	0.332
				(0.48)	(0.04)	(0.33)
lfuelex				-0.402	-0.264	-0.306
				(1.21)	(0.71)	(0.81)
lmanfex				2.237***	2.363***	1.736**
				(3.81)	(3.24)	(2.30)
lmetalex				-0.176	-0.065	0.047
				(0.53)	(0.17)	(0.12)
linfinsvex				-0.475	-0.691	-0.861
				(1.05)	(1.39)	(1.63)
ltransvex				1.574	1.342	1.356
				(1.33)	(1.02)	(1.07)
ltravsvex				0.692	0.450	0.355
				(0.87)	(0.45)	(0.35)
eap		-3.128	-1.065		-4.945*	-3.208
		(1.64)	(0.67)		(1.95)	(1.51)
lac		-2.136	-1.921		-0.858	-0.543
		(1.14)	(1.09)		(0.37)	(0.24)
sa		1.754	1.177		0.896	1.144
		(1.03)	(0.70)		(0.28)	(0.37)
ssa		1.540	1.334		0.957	-0.131
		(0.66)	(0.58)		(0.28)	(0.04)
d01			-2.635			-2.111
			(1.56)			(0.84)
d02			-5.687**			-5.508*
			(2.60)			(1.87)
d03			-2.449			-2.451
			(1.39)			(0.96)
d04			1.460			1.061
			(1.13)			(0.56)
Obs	182	182	182	156	156	156
R-squared	0.06	0.09	0.20	0.26	0.28	0.35
Countries	52	52	52	47	47	47
Wooldridge	0.2706	0.2706	0.1304	0.3416	0.3416	0.3223
BP	0.2877	0.1481	0.2100	0.9393	0.7217	0.4792
Hausman	0.2749	0.2619	0.4723	0.5854	0.7461	0.0982
sktest	0.0000	0.0000	0.0100	0.0043	0.0052	0.0872
swilk	0.0000	0.0001	0.0019	0.0037	0.0077	0.2238

A1.3 Volatility of the Purchasing Power of Exports

lppexvol	*(1)* RE	*(2)* RE	*(3)** RE	*(4)* RE	*(5)* RE	*(6)* OLS
Constant	4.711***	3.956***	4.167***	3.930***	3.547**	4.183***
	(6.08)	(3.66)	(3.94)	(3.05)	(2.25)	(3.45)
lgdpperc99	-0.161*	-0.152	-0.142	-0.105	-0.026	-0.009
	(1.91)	(1.38)	(1.28)	(0.98)	(0.18)	(0.07)
llagm2	-0.065	0.044	0.029	0.312	0.277	0.298
	(0.45)	(0.27)	(0.18)	(1.63)	(1.26)	(1.58)
srkform	-0.006	0.030	0.058	-0.163	-0.178	-0.135
	(0.06)	(0.28)	(0.51)	(1.33)	(1.30)	(1.11)
fdi	-0.018	-0.028	-0.045	-0.016	-0.011	-0.030
	(0.61)	(0.91)	(1.38)	(0.45)	(0.30)	(0.80)
linfln	0.111	0.081	0.188	0.090	0.096	0.376***
	(0.62)	(0.44)	(0.99)	(0.48)	(0.50)	(3.43)
budgbal	0.005	0.001	0.011	-0.007	-0.012	0.012
	(0.36)	(0.06)	(0.64)	(0.45)	(0.74)	(0.72)
lexpcgdp	-0.024	-0.063	-0.068	-0.104	-0.187	-0.184
	(0.17)	(0.40)	(0.44)	(0.65)	(1.02)	(1.04)
srimtax	-0.105	-0.095	-0.053	-0.087	-0.083	-0.107
	(1.60)	(1.36)	(0.74)	(1.08)	(0.94)	(1.35)
rule	0.196***	0.200***	0.141**	0.098	0.105	-0.019
	(3.33)	(3.36)	(2.10)	(1.48)	(1.53)	(0.24)
burq	0.053	0.054	0.038	-0.056	-0.081	-0.150*
	(0.69)	(0.67)	(0.47)	(0.64)	(0.87)	(1.75)
corr	-0.224***	-0.235***	-0.191***	-0.150*	-0.158*	-0.053
	(3.26)	(3.33)	(2.63)	(1.86)	(1.88)	(0.53)
ethtens	0.001	0.001	-0.026	0.053	0.064	0.037
	(0.03)	(0.03)	(0.54)	(0.97)	(1.12)	(0.57)
lexconc	0.349***	0.327**	0.338**			
	(2.59)	(2.27)	(2.30)			
lagrawex				-0.081	-0.092	-0.075
				(1.30)	(1.41)	(1.29)
lfoodex				0.112	0.104	0.154
				(1.05)	(0.87)	(1.17)
lfuelex				0.109***	0.111***	0.108***
				(3.24)	(3.13)	(3.07)
lmanfex				-0.121*	-0.119	-0.211**
				(1.65)	(1.30)	(2.10)
lmetalex				-0.023	-0.030	0.002
				(0.54)	(0.63)	(0.04)
linfinsvex				-0.023	-0.009	-0.042
				(0.52)	(0.19)	(1.15)
ltransvex				-0.105	-0.106	-0.050
				(0.95)	(0.90)	(0.45)
ltravsvex				-0.058	-0.002	-0.036
				(0.70)	(0.02)	(0.45)
eap		0.240	0.333		0.438	0.451
		(0.78)	(1.12)		(1.13)	(1.56)
lac		0.315	0.342		0.072	-0.229
		(1.13)	(1.30)		(0.20)	(0.76)
sa		0.054	-0.014		0.287	0.277
		(0.15)	(0.04)		(0.62)	(0.66)
ssa		0.369	0.299		0.427	0.095
		(1.16)	(0.98)		(1.04)	(0.31)
d01			-0.279			-0.362*
			(1.56)			(1.79)
d02			-0.356**			-0.434**
			(2.22)			(2.18)
d03			-0.369**			-0.565**
			(2.20)			(2.50)
d04			-0.250*			-0.297*
			(1.88)			(1.81)
Obs	182	182	182	156	156	156
Countries	52	52	52	47	47	47
R-squared						0.35
Wooldridge	0.9784	0.9784	0.9784	0.7420	0.7420	0.5952
RE Wald-o	0.0018	0.0073	0.0044	0.0059	0.0207	0.0286
v_i Fraction	0.3976	0.4229	0.3618	0.4245	0.4692	0.4801
BP	0.0003	0.0011	0.0012	0.0079	0.0341	0.1085
Hausman	0.1042	0.1304	0.0010	0.3435	0.5262	0.8410
sktest	0.4659	0.4556	0.6296	0.1689	0.2211	0.0333
swilk	0.4421	0.3040	0.6915	0.5800	0.5964	0.0289

A1.4 GDP per capita Growth

gdppercg	*(1a)* FE^{N}	*(1b)* RE^{N}	*(1c)* OLS*^{N}	*(2a)* FE^{N}	*(2b)* OLS*^{N}	*(3)* FE	*(4a)* RE^{N}	*(4b)* RE*^{N}
Constant	34.801***	-3.084	-3.713	24.451**	2.511	20.656**	-1.294	-1.516
	(3.70)	(0.97)	(1.42)	(2.57)	(0.91)	(2.19)	(0.35)	(0.37)
lgdpperc99	-7.592***	-0.391	-0.311	-6.532***	-0.560*	-6.156***	-0.817***	-0.775**
	(6.49)	(1.14)	(1.31)	(5.60)	(1.96)	(5.26)	(2.65)	(2.22)
llagm2	0.049	0.438	0.578	0.734	0.432	0.676	1.229**	1.247**
	(0.06)	(0.89)	(1.03)	(0.85)	(0.82)	(0.79)	(2.07)	(2.05)
srkform	1.748***	1.582***	1.637***	0.788	1.756***	0.980*	1.827***	1.787***
	(3.60)	(4.20)	(4.18)	(1.53)	(4.83)	(1.98)	(5.16)	(4.66)
fdi	0.167	0.211**	0.178*	0.105	0.201*	0.099	0.033	0.061
	(1.34)	(2.00)	(1.74)	(0.71)	(1.71)	(0.66)	(0.31)	(0.55)
linfln	0.158	-0.420	-0.859	-1.334**	-0.861	-1.530**	-0.038	-0.468
	(0.22)	(0.59)	(1.61)	(1.99)	(1.31)	(2.31)	(0.06)	(0.70)
budgbal	0.224***	0.135**	0.113*	0.076	0.134***	0.086	0.153***	0.107*
	(3.45)	(2.30)	(1.86)	(1.19)	(2.97)	(1.33)	(2.85)	(1.81)
lexpcgdp	1.780**	-0.754	-0.999**	2.113**	-1.535***	2.249***	-0.942**	-1.075**
	(2.04)	(1.54)	(2.14)	(2.44)	(3.85)	(2.63)	(2.11)	(2.32)
srimtax	-0.280	-0.022	-0.071	0.366	-0.092	0.394	-0.068	-0.189
	(0.81)	(0.09)	(0.42)	(1.13)	(0.44)	(1.22)	(0.29)	(0.77)
rule	0.069	-0.101	-0.092	0.197	0.112	0.164	-0.109	-0.087
	(0.26)	(0.41)	(0.54)	(0.65)	(0.57)	(0.54)	(0.50)	(0.36)
burq	-0.365	0.077	0.151	-0.002	0.425*	-0.103	0.055	0.005
	(0.99)	(0.29)	(0.75)	(0.01)	(1.97)	(0.25)	(0.22)	(0.02)
corr	-0.008	0.176	0.170	-0.312	-0.063	-0.355	0.323	0.299
	(0.02)	(0.70)	(0.79)	(0.91)	(0.28)	(1.02)	(1.27)	(1.16)
ethtens	-0.153	-0.092	-0.103	0.119	-0.084	0.098	-0.015	0.050
	(0.69)	(0.61)	(0.85)	(0.48)	(0.63)	(0.41)	(0.10)	(0.34)
srfemillita	2.515**	-0.169	-0.156	2.080**	-0.264**	2.123**	-0.314**	-0.263*
	(2.41)	(1.10)	(1.35)	(1.98)	(2.11)	(2.03)	(2.41)	(1.83)
lexconc	0.797	-1.269***	-1.361***					
	(1.02)	(2.79)	(2.84)					
ltotvol				-0.623*	-0.677***			
				(1.84)	(3.00)			
lppexvol						-0.294		
						(0.94)		
lagrawex							0.353**	0.327*
							(2.13)	(1.88)
lfoodex							-0.488	-0.424
							(1.63)	(1.33)
lfuelex							-0.005	0.010
							(0.05)	(0.12)
lmanfex							0.607***	0.564***
							(3.18)	(2.68)
lmetalex							-0.076	-0.073
							(0.73)	(0.67)
linfinsvex							0.049	0.074
							(0.36)	(0.52)
ltransvex							0.373	0.172
							(1.31)	(0.57)
ltravsvex							-0.212	-0.211
							(0.91)	(0.87)
d01	-4.809***	-0.097	-0.171	-3.047**	0.013	-3.380**		-0.165
	(3.30)	(0.14)	(0.25)	(1.98)	(0.02)	(2.19)		(0.23)
d02	-2.211*	1.154*	1.072*	-1.110	1.555**	-1.536		1.712**
	(1.87)	(1.93)	(1.76)	(0.89)	(2.46)	(1.24)		(2.53)
d03	-2.131**	0.391	0.447	-0.994	0.639	-1.222		0.848
	(2.35)	(0.62)	(0.62)	(1.01)	(0.99)	(1.24)		(1.21)
d04	-0.357	0.790	0.783	-0.027	0.511	-0.002		1.158**
	(0.61)	(1.51)	(1.54)	(0.04)	(1.12)	(0.00)		(2.03)
Observations	194	194	194	212	212	214	168	168
Countries	54	54	54	58	58	58	49	49
R-squared	0.49		0.42	0.43	0.45	0.42		
Wooldridge	0.0044	0.0044		0.0220		0.0132	0.0012	0.0167
RE Wald-o		0.0000		0.0000		0.0000	0.0000	0.0000
ν_i Fraction	0.9839	0.1691		0.9688		0.9670	0	0.0635
BP	0.9772	0.9772		0.7833	0.7833	0.4412	0.0055	0.0056
FE F-test-o	0.0000			0.0000		0.0000	0.0000	0.0000
FE F-test-i	0.0000			0.0000		0.0000	0.0016	0.0007
Hausman	0.0380	0.0380		0.0000		0.0000	0.1534	HF
sktest	0.0488	0.0987	0.3780	0.0268	0.0727	0.0578	0.0249	0.0050
swilk	0.1435	0.1751	0.5635	0.0198	0.1273	0.0404	0.0111	0.0031
Wooldridge-r	0.2524	0.1360	0.1102	0.4131	0.3346	0.4955	0.7010	0.5986

A1.5 Infant Mortality

srinfmort	*(1)* FE*	*(2)* RE	*(3)* RE	*(4a)* RE	*(4b)* FE-AR
Constant	9.031***	9.152***	9.190***	8.320***	2.341***
	(3.63)	(7.14)	(7.20)	(4.50)	(6.21)
lgdpperc99	-0.662**	-0.444***	-0.416***	-0.277*	-0.061
	(2.23)	(3.47)	(3.26)	(1.69)	(0.26)
llagm2	-0.310	-0.614***	-0.627***	-0.620***	-0.232
	(1.45)	(3.98)	(4.03)	(2.83)	(1.08)
srkform	0.145	0.057	0.036	-0.010	0.191**
	(1.20)	(0.60)	(0.39)	(0.08)	(2.21)
fdi	-0.020	-0.044	-0.043	-0.001	-0.010
	(0.62)	(1.54)	(1.50)	(0.02)	(0.39)
linfln	0.061	-0.038	-0.025	0.140	-0.008
	(0.33)	(0.27)	(0.18)	(0.73)	(0.07)
budgbal	-0.011	-0.029**	-0.033***	-0.042***	-0.015
	(0.69)	(2.32)	(2.63)	(2.73)	(1.27)
lexpcgdp	-0.106	-0.201	-0.200	-0.157	0.528**
	(0.46)	(1.37)	(1.36)	(0.83)	(2.21)
srimtax	0.150*	0.141**	0.135**	0.253***	0.147*
	(1.72)	(2.23)	(2.11)	(2.61)	(1.86)
rule	-0.075	-0.075	-0.082	-0.066	-0.038
	(1.11)	(1.27)	(1.35)	(0.95)	(0.70)
burq	0.072	-0.037	-0.049	-0.011	-0.098
	(0.75)	(0.47)	(0.62)	(0.11)	(1.20)
corr	-0.168**	-0.147**	-0.134*	-0.176**	0.095
	(2.00)	(2.14)	(1.88)	(2.04)	(1.39)
ethtens	0.038	0.045	0.017	0.070	0.071
	(0.65)	(0.94)	(0.36)	(1.17)	(1.40)
srfemillita	0.692***	0.628***	0.637***	0.645***	0.257
	(4.92)	(9.84)	(9.97)	(8.50)	(0.88)
lexconc	0.444**				
	(2.17)				
ltotvol		0.104			
		(1.53)			
lppexvol			0.068		
			(1.02)		
lagrawex				0.106	0.197*
				(1.34)	(1.79)
lfoodex				0.048	0.038
				(0.37)	(0.23)
lfuelex				-0.040	-0.091**
				(1.12)	(2.26)
lmanfex				-0.130	-0.056
				(1.43)	(0.51)
lmetalex				-0.047	0.031
				(0.83)	(0.41)
linfinsvex				0.025	0.033
				(0.50)	(0.82)
ltransvex				-0.159	-0.020
				(1.26)	(0.13)
ltravsvex				-0.159	0.119
				(1.63)	(1.03)
Obs	194	212	214	168	119
Countries	54	58	58	49	42
R-squared	0.67				0.47
Wooldridge	0.0000	0.0000	0.0000	0.0000	0.0000
RE Wald-o	0.0000	0.0000	0.0000	0.0000	0.0000
BP	0.0000	0.0000	0.0000	0.0000	0.0000
FE F-test-o	0.0000	0.0000	0.0000	0.0000	0.0052
FE F-test-i	0.0000	0.0000	0.0000	0.0000	0.0000
ν_i Fraction	0 .8161	0.7576	0.7486	0.7170	0.9770
Hausman	0.0000	0.4934	0.5355	0.2929	0.0004
DW					0.9228
rho					0.6948
sktest	0.0001	0.0003	0.0004	0.0009	0.1687
swilk	0.0000	0.0008	0.0007	0.0036	0.0327
Wooldridge-r	0.0000	0.0000	0.0000	0.0000	0.0000

A1.6 Under-5 Mortality

lu5mort	*(1)* FE	*(2)* RE	*(3)* FE	*(4)** FE
Constant	6.338***	6.764***	7.001***	2.291
	(5.25)	(13.70)	(6.18)	(1.07)
lgdpperc99	-0.333**	-0.310***	-0.403**	0.060
	(2.15)	(6.54)	(2.55)	(0.24)
llagm2	-0.044	-0.158***	-0.039	-0.019
	(0.52)	(2.76)	(0.50)	(0.16)
srkform	-0.004	-0.058	-0.038	0.063
	(0.08)	(1.35)	(0.61)	(0.76)
fdi	-0.004	0.003	0.003	-0.002
	(0.37)	(0.26)	(0.24)	(0.12)
linfln	0.046	0.047	0.028	0.043
	(0.81)	(0.98)	(0.55)	(0.69)
budgbal	0.008	0.011*	0.011	0.008
	(0.97)	(1.69)	(1.29)	(0.80)
lexpcgdp	-0.040	-0.111*	-0.123	0.111
	(0.40)	(1.94)	(1.45)	(0.70)
srimtax	-0.008	0.002	-0.022	0.051
	(0.24)	(0.09)	(0.80)	(0.84)
rule	-0.065**	-0.031	-0.053*	-0.103**
	(2.37)	(1.40)	(1.91)	(2.24)
burq	-0.032	-0.003	-0.046	-0.025
	(0.80)	(0.09)	(1.15)	(0.49)
corr	-0.017	-0.063**	-0.021	0.033
	(0.41)	(2.06)	(0.56)	(0.50)
ethtens	0.014	0.004	0.013	0.047
	(0.64)	(0.19)	(0.59)	(1.56)
srfemillita	0.146***	0.162***	0.171***	0.137
	(2.88)	(7.10)	(3.51)	(1.45)
lexconc	0.052			
	(0.66)			
ltotvol		0.029		
		(0.93)		
lppexvol			0.043	
			(1.28)	
lagrawex				0.020
				(0.27)
lfoodex				-0.007
				(0.07)
lfuelex				-0.010
				(0.41)
lmanfex				-0.020
				(0.24)
lmetalex				0.057
				(1.00)
linfinsvex				-0.083*
				(1.72)
ltransvex				0.049
				(0.52)
ltravsvex				-0.086
				(1.33)
Obs	112	119	119	92
Countries	48	52	52	45
R-squared	0.71		0.72	0.79
Wooldridge	0.0000	0.0000	0.0000	0.0000
RE Wald-o	0.0000	0.0000	0.0000	0.0000
BP	0.0000	0.0000	0.0000	0.0001
FE F-test-o	0.0000	0.0000	0.0000	0.0002
FE F-test-i	0.0000	0.0000	0.0000	0.0000
ν_i Fraction	0.8964	0.8435	0.8920	0.9696
Hausman	0.0337	0.4418	0.0075	0.0034
sktest	0.5205	0.2257	0.3994	0.8743
swilk	0.6600	0.5279	0.5016	0.7256
Wooldridge-r	0.0008	0.0337	0.0008	0.1190

A1.7 Immunisation against Measles

immmeas	*(1)* FE*	*(2a)* RE^{N}	*(2b)* FE*^{N}	*(2c)* OLS^{N}	*(3)* FE*	*(4)* FE*
Constant	-46.424	121.406***	-54.074	91.327***	-70.415	30.306
	(0.67)	(4.14)	(0.84)	(3.58)	(1.12)	(0.29)
lgdpperc99	17.898**	-5.993**	23.139***	-4.069	27.169***	9.102
	(2.20)	(2.09)	(3.11)	(1.59)	(3.73)	(0.81)
llagm2	-1.385	11.784***	4.775	10.771***	3.912	-1.537
	(0.24)	(2.86)	(0.79)	(2.90)	(0.66)	(0.22)
srkform	-0.214	-6.779**	-7.116**	-3.826	-5.318*	-1.061
	(0.06)	(2.51)	(2.17)	(1.45)	(1.73)	(0.29)
fdi	0.988	1.882**	2.519***	1.250	2.379***	0.051
	(1.13)	(2.19)	(2.78)	(1.37)	(2.63)	(0.06)
linfln	-5.861	3.670	-3.077	7.114*	-3.512	-8.741*
	(1.16)	(0.70)	(0.60)	(1.93)	(0.69)	(1.70)
budgbal	0.986**	0.746**	1.164***	0.341	1.246***	1.263***
	(2.30)	(1.98)	(2.97)	(0.88)	(3.23)	(2.96)
lexpcgdp	19.884***	-1.017	19.746***	-3.716	19.864***	21.010***
	(3.16)	(0.27)	(3.34)	(0.97)	(3.42)	(2.88)
srimtax	3.789	-0.677	3.483	0.020	3.545	5.762*
	(1.60)	(0.36)	(1.54)	(0.01)	(1.58)	(1.88)
rule	-2.344	2.229	-2.303	3.036*	-2.277	-2.258
	(1.26)	(1.28)	(1.21)	(1.94)	(1.20)	(1.14)
burq	-1.969	3.838*	1.581	1.515	1.280	-0.529
	(0.75)	(1.73)	(0.60)	(0.81)	(0.49)	(0.20)
corr	8.182***	2.906	6.585***	2.521	5.759**	6.323**
	(3.57)	(1.44)	(2.98)	(1.32)	(2.57)	(2.40)
ethtens	-2.934*	1.033	-3.557**	2.820**	-2.879*	-3.161*
	(1.86)	(0.77)	(2.27)	(2.16)	(1.87)	(1.72)
srfemillita	-21.416***	-5.800***	-18.296***	-4.131***	-20.655***	-24.416***
	(5.53)	(4.18)	(4.85)	(3.43)	(5.86)	(5.14)
lexconc	-19.949***					
	(3.57)					
ltotvol		-8.415***	-4.592**	-7.927***		
		(4.01)	(2.06)	(3.73)		
lppexvol					-5.105**	
					(2.42)	
lagrawex						-3.573
						(1.22)
lfoodex						-2.038
						(0.38)
lfuelex						-1.781
						(1.56)
lmanfex						8.091**
						(1.99)
lmetalex						-2.979
						(1.17)
linfinsvex						0.653
						(0.41)
ltransvex						6.427
						(1.37)
ltravsvex						1.799
						(0.51)
Obs	190	200	200	200	201	163
Countries	52	54	54	54	54	47
R-squared	0.67		0.67	0.48	0.68	0.72
Wooldridge	0.0000	0.0000	0.0000		0.0000	0.0000
RE Wald-o	0.0000	0.0000	0.0000		0.0000	0.0000
BP	0.0000	0.0159	0.0159		0.0133	0.0026
FE F-test-o	0.0000	0.0000	0.0000		0.0000	0.0000
FE F-test-i	0.0000	0.0000	0.0000		0.0000	0.0000
ν_i Fraction	0.9573	0.3914	0.9549		0.9660	0.9581
Hausman	0.0000	HF	HF		0.0000	0.0000
sktest	0.1359	0.0000	0.3790	0.0012	0.3320	0.6072
swilk	0.2010	0.0000	0.7614	0.0005	0.3221	0.8007
Wooldridge-r	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

A1.8 Immunisation against Diphtheria, Pertussis (Whooping Cough) and Tetanus

immdpt	*(1)* FE*	*(2)* FE*	*(3a)* FE*^{N}	*(3b)* RE^{N}	*(4a)* FE*^{N}	*(4b)* RE-AR^{N}
Constant	38.587	19.888	6.401	74.859***	83.646	80.436**
	(0.71)	(0.38)	(0.12)	(2.79)	(1.01)	(2.54)
lgdpperc99	3.947	9.341	13.138**	-5.207**	-0.426	-7.660***
	(0.61)	(1.53)	(2.14)	(1.98)	(0.05)	(2.85)
llagm2	-1.063	5.916	3.877	13.404***	1.927	7.201*
	(0.23)	(1.18)	(0.77)	(3.71)	(0.34)	(1.71)
srkform	2.100	-2.656	-0.443	-0.763	2.310	1.628
	(0.80)	(0.99)	(0.17)	(0.34)	(0.81)	(0.69)
fdi	1.190*	1.606**	1.626**	1.442**	0.618	0.737
	(1.70)	(2.13)	(2.11)	(2.02)	(0.85)	(1.12)
linfln	-3.444	-3.041	-3.356	-0.459	-3.785	-0.367
	(0.85)	(0.71)	(0.77)	(0.11)	(0.92)	(0.09)
budgbal	0.481	0.851***	0.944***	0.706**	0.974***	1.029***
	(1.40)	(2.61)	(2.87)	(2.30)	(2.85)	(3.23)
lexpcgdp	12.401**	12.467**	11.941**	2.943	14.625**	2.522
	(2.47)	(2.55)	(2.42)	(0.87)	(2.53)	(0.73)
srimtax	2.593	3.663*	3.771**	0.022	1.441	-1.728
	(1.37)	(1.96)	(1.98)	(0.01)	(0.59)	(0.94)
rule	-0.530	-0.228	-0.490	2.009	-2.023	0.241
	(0.36)	(0.14)	(0.31)	(1.37)	(1.28)	(0.17)
burq	0.282	1.698	1.099	3.017	1.104	2.013
	(0.13)	(0.78)	(0.50)	(1.59)	(0.52)	(1.13)
corr	5.512***	4.543**	4.348**	2.812	5.023**	3.376**
	(3.01)	(2.48)	(2.29)	(1.63)	(2.38)	(2.10)
ethtens	-1.868	-3.182**	-2.492*	-0.335	-1.020	1.015
	(1.48)	(2.45)	(1.91)	(0.29)	(0.70)	(0.90)
srfemillita	-16.077***	-13.833***	-16.890***	-6.732***	-20.216***	-6.239***
	(5.26)	(4.45)	(5.70)	(5.17)	(5.43)	(4.97)
lexconc	-17.314***					
	(3.89)					
ltotvol		-5.064***				
		(2.74)				
lppexvol			-3.077*	-2.746		
			(1.72)	(1.62)		
lagrawex					-2.389	0.637
					(1.02)	(0.46)
lfoodex					3.606	-0.302
					(0.84)	(0.13)
lfuelex					-2.045**	-0.610
					(2.28)	(0.92)
lmanfex					3.249	5.470***
					(1.00)	(3.50)
lmetalex					0.976	0.140
					(0.48)	(0.15)
linfinsvex					0.998	0.991
					(0.78)	(1.07)
ltransvex					2.134	4.820**
					(0.57)	(2.04)
ltravsvex					-0.244	0.058
					(0.09)	(0.03)
Obs	192	202	203	203	165	165
Countries	52	54	54	54	47	47
R-squared	0.65	0.64	0.63		0.72	
Wooldridge	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001
RE Wald-o	0.0000	0.0000		0.0000	0.0000	0.0000
BP	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
FE F-test-o	0.0000	0.0001	0.0000		0.0000	0.0000
FE F-test-i	0.0000	0.0000	0.0000		0.0000	0.0135
ν_i Fraction	0.9174	0.9095	0.9392	0.5393	0.9436	0.2992
Hausman	0.0001	0.0000	HF	HF	0.0000	0.8886
DW						1.1446
rho						0.5517
sktest	0.0008	0.0558	0.0254	0.0086	0.0980	0.0162
swilk	0.0028	0.1411	0.1077	0.0020	0.1002	0.0259
Wooldridge-r	0.0000	0.0000	0.0000	0.0000	0.0000	0.0012

A1.9 Female Life Expectancy at Birth

femlifexp	*(1)* RE*	*(2)* FE*	*(3)* FE*	*(4)* FE*
Constant	36.664***	36.456***	36.226***	27.672*
	(5.95)	(3.96)	(3.93)	(1.78)
lgdpperc99	4.215***	2.622**	2.531**	4.566***
	(6.63)	(2.38)	(2.29)	(2.68)
llagm2	1.866***	1.779**	1.905**	0.584
	(2.66)	(2.08)	(2.22)	(0.54)
srkform	-0.135	-1.203**	-1.182**	-1.007*
	(0.32)	(2.47)	(2.52)	(1.78)
fdi	0.023	0.370***	0.353**	0.045
	(0.20)	(2.76)	(2.60)	(0.32)
linfln	-0.397	0.882	0.812	-0.534
	(0.56)	(1.40)	(1.29)	(0.66)
budgbal	0.021	0.155***	0.167***	0.115*
	(0.36)	(2.62)	(2.81)	(1.71)
lexpcgdp	-0.093	1.997**	2.008**	1.633
	(0.13)	(2.36)	(2.38)	(1.48)
srimtax	-0.147	-0.507	-0.428	-0.104
	(0.48)	(1.65)	(1.38)	(0.23)
rule	0.274	0.609**	0.581**	0.432
	(1.16)	(2.13)	(1.99)	(1.38)
burq	-0.603*	0.355	0.408	-0.107
	(1.78)	(0.91)	(1.05)	(0.25)
corr	0.970***	0.707**	0.695**	0.835**
	(3.26)	(2.14)	(2.04)	(2.00)
ethtens	-0.335*	-0.725***	-0.654***	-0.944***
	(1.65)	(3.09)	(2.83)	(3.31)
srfemillita	-1.603***	0.468	0.356	-0.293
	(5.03)	(0.87)	(0.69)	(0.40)
lexconc	-1.582**			
	(2.40)			
ltotvol		-0.222		
		(0.68)		
lppexvol			-0.020	
			(0.07)	
lagrawex				-0.955**
				(2.07)
lfoodex				0.521
				(0.65)
lfuelex				-0.108
				(0.61)
lmanfex				1.171*
				(1.82)
lmetalex				0.162
				(0.40)
linfinsvex				0.108
				(0.43)
ltransvex				-0.380
				(0.53)
ltravsvex				1.088**
				(2.16)
Obs	194	212	214	168
Countries	54	58	58	49
R-squared		0.49	0.49	0.56
Wooldridge	0.0000	0.0000	0.0000	0.0000
RE Wald-o	0.0000	0.0000	0.0000	0.0000
BP	0.0000	0.0000	0.0000	0.0000
FE F-test-o	0.0000	0.0000	0.0000	0.0000
FE F-test-i	0.0000	0.0000	0.0000	0.0000
ν_i Fraction	0.8501	0.9434	0.9391	0.8916
Hausman	0.5268	0.0000	0.0000	0.0000
sktest	0.0000	0.0000	0.0000	0.0000
swilk	0.0000	0.0000	0.0000	0.0000
Wooldridge-r	0.0000	0.0000	0.0000	0.0105

A1.10 Female Adult Illiteracy

srfemillita	*(1)* RE*	*(2)* RE*	*(3)* RE*	*(4)* RE
Constant	15.496***	14.151***	15.762***	11.087***
	(9.82)	(9.07)	(10.09)	(3.49)
lgdpperc99	-1.110***	-1.115***	-1.237***	-0.925***
	(5.58)	(5.39)	(5.85)	(3.93)
llagm2	0.079	-0.129	-0.067	0.123
	(0.46)	(0.77)	(0.38)	(0.71)
srkform	-0.001	0.124	-0.015	0.164
	(0.01)	(1.04)	(0.12)	(0.91)
fdi	-0.087***	-0.035	-0.048	-0.023
	(3.35)	(1.22)	(1.57)	(0.65)
linfln	0.046	0.245**	0.210*	0.081
	(0.34)	(2.42)	(1.88)	(0.63)
budgbal	-0.022	-0.026**	-0.025*	-0.013
	(1.57)	(1.97)	(1.79)	(0.85)
lexpcgdp	-0.224	-0.064	-0.236	-0.084
	(1.40)	(0.40)	(1.31)	(0.37)
srimtax	-0.150**	-0.044	0.000	0.231
	(2.19)	(0.66)	(0.01)	(1.60)
rule	-0.169**	-0.134**	-0.120*	0.064
	(2.53)	(2.29)	(1.94)	(0.67)
burq	0.068	-0.057	0.010	-0.241**
	(0.57)	(0.58)	(0.09)	(1.99)
corr	0.129	0.134*	0.152*	0.034
	(1.32)	(1.68)	(1.82)	(0.28)
ethtens	-0.052	-0.072	-0.142**	0.050
	(0.83)	(1.09)	(2.14)	(0.84)
sscen	-0.015***	-0.012*	-0.010	-0.020***
	(3.95)	(1.94)	(1.51)	(5.00)
lexconc	0.385**			
	(2.28)			
ltotvol		0.157***		
		(2.74)		
lppexvol			0.148**	
			(2.42)	
lagrawex				-0.012
				(0.11)
lfoodex				-0.228
				(1.43)
lfuelex				0.070
				(1.19)
lmanfex				0.123
				(0.62)
lmetalex				0.061
				(0.91)
linfinsvex				0.016
				(0.43)
ltransvex				0.259
				(1.23)
ltravsvex				-0.149
				(1.46)
Obs	68	72	72	51
Countries	34	35	35	28
Wooldridge	0.0038	0.0046	0.0027	0.0000
RE Wald-o	0.0000	0.0000	0.0000	0.0000
BP	0.0000	0.0000	0.0000	0.0102
FE F-test-o	0.0000	0.0000	0.0000	0.0803
FE F-test-i	0.0000	0.0000	0.0000	0.0079
ν_i Fraction	0.9842	0.9865	0.9832	0.9970
Hausman	0.4811	0.0744	1.0000	0.9996
sktest	0.4693	0.6995	0.8142	0.0160
swilk	0.5914	0.6813	0.1573	0.0016
Wooldridge-r	0.2083	0.4260	0.2034	0.1573

A1.11: Female Youth Illiteracy

srfemillity	*(1)* RE*	*(2)* RE*	*(3)* RE*	*(4a)* FE[N]	*(4b)* OLS*[N]
Constant	14.332***	12.637***	14.227***	9.386	14.318**
	(7.68)	(6.31)	(7.62)	(1.91)	(2.75)
lgdpperc99	-1.129***	-1.096***	-1.226***	-0.116	-1.350***
	(4.86)	(4.18)	(4.92)	(0.33)	(4.28)
llagm2	0.153	-0.100	-0.061	-0.748	0.387
	(0.72)	(0.44)	(0.28)	(2.51)	(0.63)
srkform	0.002	0.136	-0.015	0.741*	-0.429
	(0.01)	(0.82)	(0.10)	(3.54)	(0.89)
fdi	-0.089***	-0.021	-0.035	0.161	0.102
	(2.70)	(0.51)	(0.87)	(2.90)	(1.40)
linfln	0.002	0.358**	0.257*	0.483	0.544
	(0.01)	(2.52)	(1.77)	(2.39)	(1.36)
budgbal	-0.012	-0.025	-0.023	0.055	-0.074
	(0.67)	(1.36)	(1.27)	(2.77)	(1.39)
lexpcgdp	-0.388*	-0.169	-0.439*	1.055*	-0.319
	(1.92)	(0.77)	(1.95)	(3.36)	(0.47)
srimtax	-0.262***	-0.128	-0.054	-0.352	0.142
	(3.00)	(1.40)	(0.58)	(1.75)	(0.48)
rule	-0.308***	-0.218***	-0.218***	-0.466*	0.191
	(3.63)	(2.67)	(2.74)	(3.59)	(0.80)
burq	0.104	-0.026	0.076	-0.955**	0.017
	(0.69)	(0.19)	(0.55)	(4.40)	(0.05)
corr	0.318**	0.248**	0.264**	0.723*	0.070
	(2.57)	(2.25)	(2.47)	(3.91)	(0.36)
ethtens	0.006	-0.028	-0.093	0.310**	-0.271**
	(0.08)	(0.31)	(1.10)	(4.43)	(2.16)
sscen	-0.017***	-0.015*	-0.010	-0.016*	0.005
	(3.37)	(1.69)	(1.19)	(3.79)	(0.26)
lexconc	0.397*				
	(1.86)				
ltotvol		0.148*			
		(1.83)			
lppexvol			0.245***		
			(3.11)		
lagrawex				0.193	0.043
				(1.48)	(0.22)
lfoodex				0.361	-0.073
				(1.58)	(0.22)
lfuelex				0.105	0.259**
				(1.54)	(2.14)
lmanfex				-1.806*	-0.082
				(3.71)	(0.24)
lmetalex				0.115	-0.342**
				(1.39)	(2.41)
linfinsvex				0.159*	0.076
				(3.27)	(0.81)
ltransvex				-1.694*	0.421
				(3.28)	(1.01)
ltravsvex				-0.142	-0.265
				(1.03)	(1.01)
Obs	68	72	72	51	51
Countries	34	35	35	28	28
R-squared				0.99	0.77
Wooldridge	0.0001	0.0000	0.0000	0.7021	0.7021
RE Wald-o	0.0000	0.0000	0.0000	0.0000	
BP	0.0001	0.0003	0.0000	0.0508	
FE F-test-o	0.0001	0.0000	0.0001	0.0515	
FE F-test-i	0.0000	0.0000	0.0000	0.0050	
v_i Fraction	0.9773	0.9785	0.9752	0.9995	
Hausman	0.7934	0.1042	0.9974	0.0000	
sktest	0.0341	0.0869	0.0128	0.1386	0.7387
swilk	0.0674	0.0814	0.0232	0.1012	0.1989
Wooldridge-r	0.1755	0.1751	0.2685	0.1038	0.0708

A1.12 Malnutrition Prevalence among Children Under 5, height for age

srmalnuth	*(1)* FE	*(2)* RE	*(3)* FE	*(4)* FE*^{N}
Constant	9.468**	11.698***	9.777**	4.381
	(2.10)	(6.24)	(2.11)	(0.60)
lgdpperc99	-0.834	-0.782***	-0.829	-0.099
	(1.25)	(4.07)	(1.37)	(0.12)
llagm2	-0.888**	-0.261	-0.622*	-0.823*
	(2.44)	(1.14)	(1.73)	(1.80)
srkform	-0.013	0.088	-0.142	-0.312
	(0.06)	(0.53)	(0.65)	(0.84)
fdi	0.116*	-0.014	0.084	0.088
	(2.02)	(0.34)	(1.55)	(1.10)
linfln	1.368**	0.331	1.493**	0.761
	(2.06)	(1.05)	(2.21)	(0.80)
budgbal	0.065*	0.027	0.032	0.025
	(1.90)	(1.22)	(1.15)	(0.79)
lexpcgdp	0.632	-0.176	0.335	0.878
	(1.49)	(0.69)	(0.74)	(1.47)
srimtax	0.252	0.110	0.117	0.333
	(1.67)	(1.10)	(0.90)	(1.69)
rule	-0.207	-0.126	-0.248	-0.112
	(1.37)	(1.22)	(1.66)	(0.61)
burq	0.401*	-0.062	0.222	0.333
	(1.90)	(0.48)	(1.12)	(1.15)
corr	0.013	0.087	0.080	0.155
	(0.09)	(0.73)	(0.50)	(0.74)
ethtens	-0.145	-0.181**	-0.097	-0.204
	(1.58)	(2.38)	(1.06)	(1.35)
srfemillita	0.337	0.074	0.364	0.253
	(1.13)	(0.86)	(1.40)	(0.54)
lexconc	0.409			
	(1.08)			
ltotvol		0.021		
		(0.21)		
lppexvol			0.109	
			(0.73)	
lagrawex				0.443*
				(1.74)
lfoodex				-0.027
				(0.07)
lfuelex				-0.011
				(0.09)
lmanfex				-0.307
				(0.84)
lmetalex				-0.268
				(1.29)
linfinsvex				0.142
				(0.83)
ltransvex				-0.027
				(0.06)
ltravsvex				0.353
				(1.16)
Obs	93	98	98	82
Countries	43	43	43	37
R-squared	0.65		0.59	0.70
Wooldridge	0.6252	0.0482	0.0675	0.8424
RE Wald-o	0.0000	0.0000	0.0000	0.0000
BP	0.0014	0.0000	0.0000	0.2182
FE F-test-o	0.0001	0.0002	0.0002	0.0113
FE F-test-i	0.0000	0.0000	0.0000	0.0011
v_i Fraction	0.9038	0.6814	0.8731	0.9041
Hausman	0.0009	0.0649	0.0124	0.2575
sktest	0.4461	0.7354	0.2164	0.1942
swilk	0.6534	0.5093	0.2785	0.2497
Wooldridge-r	0.1539	0.0416	0.0257	0.5546

A1.13: Malnutrition Prevalence among Children Under 5, weight for age

srmalnutw	*(1)* FE	*(2)* FE	*(3)* FE	*(4a)* FE^{N}	*(4b)* OLS*^{N}
Constant	10.336***	11.445***	10.806***	10.033*	11.448***
	(2.92)	(3.39)	(3.16)	(1.72)	(3.81)
lgdpperc99	-1.114**	-1.422***	-1.320***	-0.846	-0.784***
	(2.16)	(3.39)	(3.20)	(1.22)	(2.89)
llagm2	-0.028	0.010	0.021	0.028	-0.105
	(0.10)	(0.04)	(0.08)	(0.08)	(0.23)
srkform	0.161	0.170	0.193	-0.030	0.028
	(0.89)	(1.07)	(1.18)	(0.10)	(0.12)
fdi	0.000	-0.017	-0.017	0.005	-0.069
	(0.01)	(0.47)	(0.44)	(0.08)	(1.02)
linfln	0.779	0.862*	0.876*	0.807	-0.027
	(1.48)	(1.70)	(1.70)	(1.05)	(0.11)
budgbal	0.042	0.016	0.022	0.025	0.040
	(1.53)	(0.78)	(1.11)	(1.00)	(1.33)
lexpcgdp	0.104	0.055	0.092	0.010	-0.029
	(0.32)	(0.18)	(0.28)	(0.02)	(0.07)
srimtax	0.098	0.027	0.007	0.169	0.245
	(0.76)	(0.26)	(0.06)	(1.01)	(1.52)
rule	-0.210*	-0.177	-0.197*	-0.136	-0.034
	(1.80)	(1.62)	(1.81)	(0.92)	(0.25)
burq	0.075	0.058	0.023	0.108	-0.031
	(0.46)	(0.40)	(0.16)	(0.46)	(0.21)
corr	0.046	0.051	0.062	0.147	0.086
	(0.40)	(0.46)	(0.53)	(0.87)	(0.37)
ethtens	0.075	0.080	0.094	-0.008	-0.398***
	(1.06)	(1.20)	(1.40)	(0.07)	(3.73)
srfemillita	0.119	0.296	0.241	0.125	-0.031
	(0.49)	(1.59)	(1.35)	(0.33)	(0.31)
lexconc	0.307				
	(1.05)				
ltotvol		-0.101			
		(0.94)			
lppexvol			-0.030		
			(0.26)		
lagrawex				0.125	0.050
				(0.62)	(0.45)
lfoodex				-0.273	-0.255
				(0.84)	(1.04)
lfuelex				-0.085	-0.043
				(0.79)	(0.53)
lmanfex				-0.498	0.353*
				(1.70)	(1.75)
lmetalex				-0.169	-0.174*
				(1.01)	(1.91)
linfinsvex				0.043	0.058
				(0.32)	(0.69)
ltransvex				0.126	-0.400
				(0.35)	(1.64)
ltravsvex				0.214	-0.073
				(0.89)	(0.33)
Obs	96	102	102	83	83
Countries	44	44	44	38	38
R-squared	0.53	0.55	0.54	0.63	0.77
Wooldridge	0.6827	0.5782	0.7095	0.1290	0.1290
RE Wald-o	0.0000	0.0000	0.0000	0.0000	
BP	0.0000	0.0000	0.0000	0.0030	
FE F-test-o	0.0028	0.0003	0.0005	0.0615	
FE F-test-i	0.0000	0.0000	0.0000	0.0000	
ν_i Fraction	0.9268	0.9398	0.9303	0.9403	
Hausman	0.0003	0.0000	0.0000	0.0040	
sktest	0.0224	0.1780	0.0957	0.8469	0.9207
swilk	0.0109	0.2146	0.1258	0.9643	0.8942
Wooldridge-r	0.3106	0.4089	0.4947	0.0911	0.4292

A1.14 Low Birth-Weight Babies

llowbwbs	*(1)* RE	*(2)* RE	*(3a)* RE	*(3b)* OLS	*(4a)* FE^N	*(4b)* OLS^{*N}
Constant	4.912***	3.936***	4.266***	4.806***	1.695	5.510***
	(6.04)	(4.10)	(4.46)	(4.94)	(0.31)	(6.36)
lgdpperc99	-0.243***	-0.200**	-0.230**	-0.291***	-0.105	-0.339***
	(2.80)	(2.05)	(2.37)	(3.08)	(0.17)	(4.22)
llagm2	-0.054	-0.140	-0.121	-0.035	-0.055	0.025
	(0.49)	(1.18)	(1.00)	(0.30)	(0.19)	(0.16)
srkform	-0.101	0.049	0.020	-0.005	0.174	-0.195**
	(1.14)	(0.56)	(0.22)	(0.04)	(1.01)	(2.16)
fdi	0.054*	0.012	0.011	0.051	-0.037	0.069*
	(1.65)	(0.35)	(0.30)	(1.05)	(0.58)	(1.90)
linfln	0.206	0.235	0.224	0.102	0.641**	0.318***
	(1.44)	(1.48)	(1.38)	(1.09)	(2.19)	(2.76)
budgbal	-0.005	0.005	0.007	0.004	0.005	-0.010
	(0.44)	(0.47)	(0.57)	(0.17)	(0.22)	(0.69)
lexpcgdp	0.054	0.099	0.071	-0.040	0.493	0.037
	(0.44)	(0.86)	(0.60)	(0.27)	(1.60)	(0.25)
srimtax	-0.030	-0.056	-0.051	0.008	-0.156	-0.007
	(0.52)	(1.07)	(0.94)	(0.17)	(1.48)	(0.12)
rule	-0.034	-0.063	-0.066	-0.015	-0.052	0.060
	(0.69)	(1.19)	(1.19)	(0.25)	(0.64)	(1.18)
burq	0.158**	0.091	0.113	0.145**	0.066	0.181***
	(2.47)	(1.34)	(1.61)	(2.27)	(0.57)	(3.00)
corr	-0.130**	-0.029	-0.029	-0.102	0.065	-0.195***
	(2.23)	(0.46)	(0.45)	(1.33)	(0.50)	(3.06)
ethtens	-0.073*	-0.066	-0.043	-0.047	-0.105	-0.102***
	(1.84)	(1.53)	(1.02)	(1.32)	(1.28)	(2.76)
srfemillita	-0.003	0.018	0.012	-0.036	-0.064	-0.034
	(0.07)	(0.41)	(0.27)	(1.14)	(0.28)	(0.89)
lexconc	0.041					
	(0.36)					
ltotvol		0.028				
		(0.48)				
lppexvol			-0.005	0.035		
			(0.07)	(0.47)		
lagrawex					-0.166	-0.049
					(1.19)	(1.31)
lfoodex					0.201	0.040
					(0.84)	(0.56)
lfuelex					0.010	0.016
					(0.21)	(0.74)
lmanfex					0.114	0.029
					(0.55)	(0.58)
lmetalex					0.213*	-0.067**
					(1.91)	(2.12)
linfinsvex					-0.078	-0.023
					(1.39)	(0.68)
ltransvex					-0.296	-0.017
					(1.38)	(0.22)
ltravsvex					-0.167	0.066
					(1.10)	(0.93)
Obs	112	122	123	123	100	100
Countries	46	52	52	52	44	44
R-squared				0.31	0.34	0.54
Wooldridge	0.1266	0.1916	0.2358	0.2358	0.0432	0.0432
RE Wald-o	0.0001	0.0506	0.1072		0.0010	
BP	0.0234	0.0431	0.0447		0.1136	
FE F-test-o	0.3085	0.0895	0.3652		0.6169	
FE F-test-i	0.0006	0.0000	0.0000		0.0020	
ν_i Fraction	0.4547	0.6736	0.6326		0.9258	
Hausman	0.1038	0.1096	0.3389		0.0389	
sktest	0.0002	0.0001	0.0001	0.0000	0.0570	0.0173
swilk	0.0006	0.0002	0.0001	0.0000	0.1792	0.0173
Wooldridge-r	0.4261	0.7863	0.3045	0.2311	0.4513	0.3462

Appendix 2: Country List and Time Periods

East Asia & the Pacific (EAP)

Brunei
China
Hong Kong (China)
Indonesia
Malaysia
Myanmar (Burma)
Papua New Guinea
Philippines
Singapore
South Korea
Thailand

Latin America & the Caribbean (LAC)

Argentina
Bolivia
Brazil
Chile
Colombia
Costa Rica
Dominican Republic
Ecuador
El Salvador
Guatemala
Guyana
Haiti
Honduras
Jamaica
Mexico
Nicaragua
Panama
Paraguay
Peru
Suriname
Trinidad & Tobago
Uruguay
Venezuela

Middle-East, North Africa, Turkey & Malta (MENA)

Algeria
Egypt
Iran
Israel
Jordan
Lebanon
Libya
Malta
Morocco
Oman
Qatar
Saudi Arabia
Syria
Tunisia
Turkey
United Arab Emirates

South Asia (SA)

Bangladesh
India
Pakistan
Sri Lanka

Sub-Saharan Africa (SSA)

Angola
Botswana
Burkina Faso
Cameroon
Congo
Congo, Dem. Rep. (Zaire)
Côte d'Ivoire
Ethiopia
Gabon
Gambia
Ghana
Guinea
Guinea-Bissau
Kenya
Liberia
Madagascar
Malawi
Mali
Mozambique
Niger
Nigeria
Senegal
Sierra Leone
Somalia
Sudan
Tanzania
Togo
Uganda
Zambia
Zimbabwe

Time Periods

Period 1	1981 - 1984
Period 2	1985 - 1988
Period 3	1989 - 1992
Period 4	1993 - 1996
Period 5	1997 - 2000

Appendix 3: Variable Definitions and Data Sources

Note: Definitions are predominantly direct quotes from sources.

BUDGBAL: *Overall budget balance, including grants (% of GDP)*
Overall budget balance is current and capital revenue and official grants received, less total expenditure and lending minus repayments. Data are shown for central government only.
Three outliers for BUDGBAL were deleted from the dataset: Guyana 1981-84: -41.56% and 1985-88: -42.24%; and Sudan 1981-84: -39.25%.
Source: *World Bank World Development Indicators* 2002 CD-Rom. Data originally from the IMF, Government Finance Statistics Yearbook and data files, and World Bank and OECD GDP estimates.

BURQ: *Quality of the bureaucracy*
This variable ranges from 0 to 6 and reflects the quality of the government bureaucracy. High scores indicate "an established mechanism for recruitment and training", "autonomy from political pressure", and "strength and expertise to govern without drastic changes in policy or interruptions in government services" when governments change.
Source: *IRIS-3 Dataset*, compiled by Stephen Knack from monthly ICRG (International Country Risk Guide) data provided by the PRS group. http://www.countrydata.com/datasets/

CORR: *Corruption in Government*
This variable ranges from 0 to 6 and reflects the degree of corruption in government. Lower scores indicate "high government officials are likely to demand special payments" and that "illegal payments are generally expected throughout lower levels of government" in the form of "bribes connected with import and export licenses, exchange controls, tax assessment, police protection, or loans".
Source: *IRIS-3 Dataset*, compiled by Stephen Knack from monthly ICRG (International Country Risk Guide) data provided by the PRS group. http://www.countrydata.com/datasets/

DPPEX: *First difference of the index of purchasing power of exports (PPEX) (Index: 1990 = 100).*

$$dPPEX_t = PPEX_t - PPEX_{t-1} \text{ where } t = 1981 \text{ to } 2000$$

PPEX is measured as the value index of exports *deflated* by the import unit value index. This is different from the so-called net barter terms of trade, defined as the *ratio* of the export unit value index to the import unit value index.
Source: *UNCTAD Handbook of Statistics on CD-Rom 2002*, UNCTAD Geneva.

DTOT: *First difference of the net barter terms of trade (TOT) (Index: 1990 = 100).*

$$dTOT_t = TOT_t - TOT_{t-1}; \; t = 1981 \text{ to } 2000$$

TOT refers to the net barter terms of trade, defined as the ratio of the export unit value index to the import unit value index.
Source: *UNCTAD Handbook of Statistics on CD-Rom 2002*, UNCTAD Geneva.

EAP: *Dummy variable for East Asia*
See Appendix 2: Country List and Time Periods for countries.

ETHTENS: *Ethnic Tension*
This variable "measures the degree of tension within a country attributable to racial, nationality, or language divisions. Lower ratings are given to countries where racial and nationality tensions are high because opposing groups are intolerant and unwilling to compromise. Higher ratings are given to countries where tensions are minimal, even though such differences may still exist".
Source: *IRIS-3 Dataset*, compiled by Stephen Knack from monthly ICRG (International Country Risk Guide) data provided by the PRS group. http://www.countrydata.com/datasets/

FDI: *Foreign direct investment, net inflows (% of GDP)*
Foreign direct investment is net inflows of investment to acquire a lasting management interest (10 percent or more of voting stock) in an enterprise operating in an economy other than that of the investor. It is the sum of equity capital, reinvestment of earnings, other long-term capital, and short-term capital as shown in the balance of payments. This series shows net inflows in the reporting economy. Two outliers for FDI were deleted from the dataset: Angola 1997-2000: 20.43%; Guyana 1993-96: 15.04%.
Source: *World Bank World Development Indicators* 2002 CD-Rom. Data originally from the IMF, International Financial Statistics and Balance of Payments databases, World Bank, Global Development Finance, and World Bank and OECD GDP estimates.

GDPPERCG: *GDP per capita growth (annual %)*
Annual percentage growth rate of GDP per capita based on constant local currency. GDP per capita is gross domestic product divided by midyear population. GDP is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources.
Source: *World Bank World Development Indicators* 2002 CD-Rom. Data originally from the World Bank national accounts data, and OECD National Accounts data files.

GDPPERC99: *GDP per capita (constant 1999 US$)*
GDP per capita is gross domestic product divided by midyear population. GDP is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources. Data are in constant 1999 U.S. dollars, converted from constant 1995 US dollar series using conversion rate of $1 in 1995 = $1.068429489 in $1999 from the US GDP deflator series on the World Bank CD-Rom.
Source: *World Bank World Development Indicators* 2002 CD-Rom. Data originally from the World Bank national accounts data, and OECD National Accounts data files.

IMMDPT: *Immunisation, DPT (% of children immunised under 12 months)*
Child immunisation measures the rate of vaccination coverage of children under one year of age. A child is considered adequately immunised against diphtheria, pertussis (or whooping cough), and tetanus (DPT) after receiving three doses of vaccine.
Source: *World Bank World Development Indicators* 2002 CD-Rom. Data originally from the World Health Organization.

IMMMEAS: *Immunisation, measles (% of children immunised under 12 months)*
Child immunisation measures the rate of vaccination coverage of children under one year of age. A child is considered adequately immunised against measles after receiving one dose of vaccine.
Source: *World Bank World Development Indicators* 2002 CD-Rom. Data originally from the World Health Organization.

LAC: *Dummy variable for Latin America and the Caribbean*
See Appendix 2: Country List and Time Periods for countries.

LAGRAWEX: *Agricultural raw materials exports*
(natural log of AGRAWEX, the percentage of agricultural raw materials in total exports)
Agricultural raw materials comprise SITC section 2 (crude materials except fuels) excluding divisions 22, 27 (crude fertilizers and minerals excluding coal, petroleum, and precious stones), and 28 (metalliferous ores and scrap).
Source: *World Bank World Development Indicators* 2002 CD-Rom. Data originally from World Bank staff estimates from the COMTRADE database maintained by the United Nations Statistics division.

LCOMSVEX: *Services exports related to communications, computer, information and other services (Natural log of COMSVEX, the percentage of communications, computer, information and other services in total exports)*
LCOMSVEX covers international telecommunications and postal and courier services; computer data; news-related service transactions between residents and nonresidents; construction services; royalties and license fees; miscellaneous business, professional, and technical services; personal, cultural, and recreational services; and government services not included elsewhere. Service exports refer to economic output of intangible commodities that may be produced, transferred, and consumed at the same time. International transactions in services are defined by the IMF's Balance of Payments Manual (1993), but definitions may nevertheless vary among reporting economies.
Note: LCOMSVEX was omitted from regressions involving export shares to prevent multicollinearity.
Source: *World Bank World Development Indicators* 2002 CD-Rom. Data originally from IMF Balance of Payments Statistics Yearbook and data files, and World Bank staff estimates.

LEXCONC: *Natural log of EXCONC, an Export Concentration Index*
(Index: 0 = least concentrated, 1 = maximum concentration)
The export concentration index is a modified version of the Hirschmann index. It is calculated as a square root of the sum of the ratios (raised to the power of two) of each of the 239 products at the three-digit SITC, Revision 2 level to total exports or imports. The result is then normalized by a square root of 1 over 239 to obtain numeric range from 0 to 1 (maximum concentration). i.e.

$$H_j = \frac{\sqrt{\sum_{i=1}^{239}\left(\frac{x_i}{X}\right)^2} - \sqrt{1/239}}{1-\sqrt{1/239}} \qquad \text{where,}$$

H_j is the country index; x_i is the value of exports of product i; and $X = \sum_{i=1}^{239} x_i$
Source: *UNCTAD Handbook of Statistics on CD-Rom 2002*, UNCTAD Geneva.

LEXPCGDP: *Exports of goods and services (natural log of EXPCGDP, exports as a percentage of GDP)*
Exports of goods and services represent the value of all goods and other market services provided to the rest of the world. They include the value of merchandise, freight, insurance, transport, travel, royalties, license fees, and other services, such as communication, construction, financial, information, business, personal, and government services. They exclude labor and property income (formerly called factor services) as well as transfer payments.
Source: *World Bank World Development Indicators* 2002 CD-Rom. Data originally from World Bank national accounts data, and OECD National Accounts data files.

LFOODEX: *Food exports (natural log of FOODEX, the percentage of food in total exports)*
Food comprises the commodities in SITC sections 0 (food and live animals), 1 (beverages and tobacco), and 4 (animal and vegetable oils and fats) and SITC division 22 (oil seeds, oil nuts, and oil kernels).
Source: *World Bank World Development Indicators* 2002 CD-Rom. Data originally from World Bank staff estimates from the COMTRADE database maintained by the United Nations Statistics division.

LFUELEX: *Fuel exports (natural log of FUELEX, the percentage of fuels in total exports)*
Fuels comprise SITC section 3 (mineral fuels).
Source: *World Bank World Development Indicators* 2002 CD-Rom. Data originally from World Bank staff estimates from the COMTRADE database maintained by the United Nations Statistics division.

LGDPPERC99: *The natural log of GDP per capita (constant 1999 US$) for the final year of the previous period.* Except for: 1966 for Gambia, and 1967 for Mali instead of 1965 for period 2.

LINFINSVEX: *Insurance and financial services*
(natural log of INFINSVEX, the percentage of insurance and financial services in total exports)
Insurance and financial services cover various types of insurance provided to nonresidents by resident insurance enterprises and vice versa, and financial intermediary and auxiliary services (except those of insurance enterprises and pension funds) exchanged between residents and nonresidents. Service exports refer to economic output of intangible commodities that may be produced, transferred, and consumed at the same time. International transactions in services are defined by the IMF's Balance of Payments Manual (1993), but definitions may nevertheless vary among reporting economies.
Source: *World Bank World Development Indicators* 2002 CD-Rom. Data originally from IMF Balance of Payments Statistics Yearbook and data files, and World Bank staff estimates.

LINFLN: *Inflation, consumer prices (natural log of (1+ annual percentage/100))*
Inflation as measured by the consumer price index reflects the annual percentage change in the cost to the average consumer of acquiring a fixed basket of goods and services that may be fixed or changed at specified intervals, such as yearly. The Laspeyres formula is generally used.
The following six outliers for inflation were deleted from the dataset: Angola 1993-96: 2286%; Congo, Dem. Rep. 1996-96: 6740%; Bolivia 1985-88: 3014%; Nicaragua 1985-88: 3004% and 1989-92: 3806%; Peru 1989-92:2841%.
Source: *World Bank World Development Indicators* 2002 CD-Rom. Data originally from the IMF, International Financial Statistics and data files.

LLAGM2: *Natural log of Money and quasi money (M2) as a percentage of GDP, lagged one period*
Money and quasi money comprise the sum of currency outside banks, demand deposits other than those of the central government, and the time, savings, and foreign currency deposits of resident sectors other than the central government. This definition of money supply is frequently called M2; it corresponds to lines 34 and 35 in the IMF's (IMF) International Financial Statistics (IFS).
Source: *World Bank World Development Indicators* 2002 CD-Rom. Data originally from the IMF, International Financial Statistics and data files, and World Bank and OECD GDP estimates.

LLOWBWBS: *Low birth-weight babies*
(natural log of LOWBWBS, the percentage low birth-weight babies in total births)
Low birth-weight babies are newborns weighing less than 2,500 grams, with the measurement taken within the first hours of life, before significant postnatal weight loss has occurred.
Source: *World Bank World Development Indicators* 2002 CD-Rom. Data originally from the World Health Organization and UNICEF.

LMANFEX: *Manufactures exports (natural log of MANFEX, the percentage manufactures in total exports)*
Manufactures comprise commodities in SITC sections 5 (chemicals), 6 (basic manufactures), 7 (machinery and transport equipment), and 8 (miscellaneous manufactured goods), excluding division 68 (non-ferrous metals).
Source: *World Bank World Development Indicators* 2002 CD-Rom. Data originally from World Bank staff estimates from the COMTRADE database maintained by the United Nations Statistics division.

LMETALEX: *Ores and metals exports*
(natural log of METALEX, the percentage of metals and ores in total exports)
Ores and metals comprise the commodities in SITC sections 27 (crude fertilizer, crude minerals); 28 (metalliferous ores, scrap); and 68 (non-ferrous metals).
Source: *World Bank World Development Indicators* 2002 CD-Rom. Data originally from World Bank staff estimates from the COMTRADE database maintained by the United Nations Statistics division.

LPPEXVOL: *Natural log of PPEXVOL, the volatility of the purchasing power of exports*
The volatility of the purchasing power of exports is measured as the average volatility, PPEXVOL, for each period where PPEXVOL is the square root of the square of the demeaned first difference of the export purchasing power index, PPEX, for that period:

$$PPEXVOL_t = \sqrt{\left[dPPEX_t - \frac{1}{n} \sum_{i=1981}^{2000} dPPEX_i \right]^2} \quad \text{where} \quad dPPEX_t = PPEX_t - PPEX_{t-1};$$

i = 1981 to 2000; n = 20

Purchasing power of exports refers to the value index of exports *deflated* by the import unit value index. This is different from the so-called "net barter" terms of trade, defined as the *ratio* of the export unit value index to the import unit value index.
Source: Annual PPEX index from *UNCTAD Handbook of Statistics on CD-Rom 2002*, UNCTAD Geneva.

LTOTVOL: *Natural log of TOTVOL, the terms of trade volatility*
Terms of trade volatility for each country is measured as the average terms of trade volatility, TOTVOL, for each period where TOTVOL is the square root of the square of the demeaned first difference of the terms of trade index, TOT, for that period:

$$TOTVOL_t = \sqrt{\left[dTOT_t - \frac{1}{n} \sum_{i=1981}^{2000} dTOT_i \right]^2} \quad \text{where} \quad dTOT_t = TOT_t - TOT_{t-1};$$

i = 1981 to 2000; n = 20

Terms of trade refers to the net barter terms of trade defined as the ratio of the export unit value index to the import unit value index. The following outliers for TOTVOL were deleted from the database: Uganda 1981-84: 90.30%; Iran 1981-84: 78.92%.
Source: Annual TOT index from *UNCTAD Handbook of Statistics on CD-Rom 2002*, UNCTAD, Geneva.

LTRANSVEX: *Transport services exports*
(natural log of TRANSVEX, the % of transport services in total exports)
LTRANSVEX covers all transport services (sea, air, land, internal waterway, space, and pipeline) performed by residents of one economy for those of another and involving the carriage of passengers, movement of goods (freight), rental of carriers with crew, and related support and auxiliary services. Excluded are freight insurance, which is included in insurance services; goods procured in ports by nonresident carriers and repairs of transport equipment, which are included in goods; repairs of railway facilities, harbours, and airfield facilities, which are included in construction services; and rental of carriers without crew, which is included in other services. Service exports refer to economic output of intangible commodities that may be produced, transferred, and consumed at the same time. International transactions in services are defined by the IMF's Balance of Payments Manual (1993), but definitions may nevertheless vary among reporting economies.
Source: *World Bank World Development Indicators* 2002 CD-Rom. Data originally from IMF Balance of Payments Statistics Yearbook and data files, and World Bank staff estimates.

LTRAVSVEX: *Travel services (natural log of TRAVSVEX, the % of travel services in total exports)*
LTRAVSVEX covers goods and services acquired from an economy by travellers for their own use during visits of less than one year in that economy for either business or personal purposes. Service exports refer to economic output of intangible commodities that may be produced, transferred, and consumed at the same time. International transactions in services are defined by the IMF's Balance of Payments Manual (1993), but definitions may nevertheless vary among reporting economies.
Source: *World Bank World Development Indicators* 2002 CD-Rom. Data originally from IMF Balance of Payments Statistics Yearbook and data files, and World Bank staff estimates.

LU5MORT: *Mortality rate, under-5 (natural log of U5MORT, under-5 mortality rates per 1,000 live births)*
Under-5 mortality rate is the probability that a newborn baby will die before reaching age five, if subject to current age-specific mortality rates. The probability is expressed as a rate per 1,000.
Source: *World Bank World Development Indicators* 2002 CD-Rom. Data originally from World Bank staff estimates using data from the United Nations and UNICEF, State of the World's Children.

MENA: *Dummy variable for the Middle East, North Africa, Turkey and Malta*
See Appendix 2: Country List and Time Periods for countries.

RULE: *Rule of Law*
This variable ranges from 0 to 6 and "reflects the degree to which the citizens of a country are willing to accept the established institutions to make and implement laws and adjudicate disputes". Higher scores indicate: "sound political institutions, a strong court system, and provisions for an orderly succession of power". Lower scores indicate: "a tradition of depending on physical force or illegal means to settle claims". Upon changes in government, new leaders "may be less likely to accept the obligations of the previous regime".
Source: *IRIS-3 Dataset*, compiled by Stephen Knack from monthly ICRG (International Country Risk Guide) data provided by the PRS group. http://www.countrydata.com/datasets/

SA: *Dummy variable for South Asia*
See Appendix 2: Country List and Time Periods for countries.

SSA: *Dummy variable for Sub-Saharan Africa*
See Appendix 2: Country List and Time Periods for countries.

SSCEN: *School enrolment, secondary (% net)*
Net enrolment ratio is the ratio of the number of children of official school age (as defined by the national education system) who are enrolled in school to the population of the corresponding official school age. Secondary education completes the provision of basic education that began at the primary level, and aims at laying the foundations for lifelong learning and human development, by offering more subject- or skill-oriented instruction using more specialised teachers. Based on the International Standard Classification of Education, 1976 (ISCED76) and 1997 (ISCED97).
Source: *World Bank World Development Indicators* 2002 CD-Rom. Data originally from the United Nations Educational, Scientific, and Cultural Organization.

SRFEMILLITA: *Female adult Illiteracy rate*
(square root of FEMILLITA, the percentage of illiterate females aged 15 and above)
Adult illiteracy rate is the percentage of people aged 15 and above who cannot, with understanding, read and write a short, simple statement on their everyday life.
Source: *World Bank World Development Indicators* 2002 CD-Rom. Data originally from the United Nations Educational, Scientific, and Cultural Organization.

SRFEMILLITY: *Female youth illiteracy rate*
(square root of FEMILLITY, the percentage of illiterate females aged 15-24)
Youth illiteracy rate is the percentage of people aged 15-24 who cannot, with understanding, read and write a short, simple statement on their everyday life.
Source: *World Bank World Development Indicators* 2002 CD-Rom. Data originally from the United Nations Educational, Scientific, and Cultural Organization.

SRIMTAX: *Import taxes (square root of IMTAX, the percentage tax on imports)*
Import taxes comprise all levies collected on goods at the point of entry into the country. The levies may be imposed for revenue or protection purposes and may be determined on a specific or *ad valorem* basis, as long as they are restricted to imported products. Data are shown for central government only.
The following outlier for IMTAX was deleted from the dataset: Sudan, 198-84: 278.40%.
Source: *World Bank World Development Indicators* 2002 CD-Rom. Data originally from the IMF's Government Finance Statistics Yearbook and data files, and World Bank and OECD imports estimates.

SRINFMORT: *Infant mortality rate (square root of INFMORT, infant mortality per 1,000 live births)*
Infant mortality rate is the number of infants dying before reaching one year of age, per 1,000 live births in a given year.
Source: *World Bank World Development Indicators* 2002 CD-Rom. Data originally from the World Bank staff estimates using data from the United Nations and UNICEF, State of the World's Children.

SRKFORM: *Gross fixed capital formation (formerly gross domestic fixed investment)*
(square root of KFORM, gross fixed capital formation as a percentage of GDP)
Gross fixed capital formation includes land improvements (fences, ditches, drains, and so on); plant, machinery, and equipment purchases; and the construction of roads, railways, and the like, including schools, offices, hospitals, private residential dwellings, and commercial and industrial buildings. According to the 1993 SNA, net acquisitions of valuables are also considered capital formation.
Source: *World Bank World Development Indicators* 2002 CD-Rom. Data originally from the World Bank national accounts data, and OECD National Accounts data files.

SRMALNUTH: *Malnutrition prevalence, height for age*
(square root of MALNUTH the percentage of malnourished children under 5)
Prevalence of child malnutrition (height for age) is the percentage of children under five whose height for age is less than minus two standard deviations from the median for the international reference population aged 0 to 59 months. For children up to two years of age, height is measured by recumbent length. For older children, height is measured by stature while standing. The reference population adopted by the WHO in 1983, is based on children from the United States, who are assumed to be well nourished.
Source: *World Bank World Development Indicators* 2002 CD-Rom. Data originally from the World Health Organization.

SRMALNUTW: *Malnutrition prevalence, weight for age*
(square root of MALNUTW the percentage of malnourished children under 5)
Prevalence of child malnutrition (weight for age) is the percentage of children under five whose weight for age is less than minus two standard deviations from the median for the international reference population aged 0 to 59 months. The reference population adopted by the WHO in 1983, is based on children from the United States, who are assumed to be well nourished.
Source: *World Bank World Development Indicators* 2002 CD-Rom. Data originally from the WHO.

Notes on the Export Data:

AGRAWEX + FOODEX + FUELEX + MANFEX + METALEX + INFINSVEX + COMSVEX + TRANSVEX + TRAVSVEX *approximately* = 100%

Data for AGRAWEX, FOODEX, FUELEX, MANFEX and METALEX are given by the World Bank only as percentages of merchandise (goods) exports. Similarly, INFINSVEX, COMSVEX, TRANSVEX and TRAVSVEX are given only as percentages of total services exports. To derive equivalent measures of *total* exports, the following procedure was adopted:

1. First the data on merchandise categories as a percentage of merchandise exports was examined. All observations for which there was data on all five categories but for which AGRAWEX + FOODEX + FUELEX + MANFEX + METALEX summed to less than 95%, were deleted since there was no way of knowing which data were faulty. This resulted in most of the observations for the Philippines and South Africa being culled as well as a number of others.

2. Second, data on service categories as a percentage of service exports was examined. In almost every case, the four categories summed to 100%, suggesting either a miracle or a certain degree of data massaging. In any case, all observations for which a single category accounted for 100% of services exports were deleted since it was felt that this was most likely to be a result of sloppy statistical reporting than genuine information. For example, the Saudi Arabian series provide a nuanced breakdown across three categories from 1971 to 1981 but then inexplicably communications and computer services account for 100% of services exports from 1982 until 2000. Observations deleted for this reason were: Gambia 1979-80, Oman 1978-88, 1992-95, Saudi Arabia 1982-2000, and Uganda 1986, 1991-92. The data for Haiti in 1994 showed a very strange rearrangement of shares compared with adjacent years, so the observation was deleted as suspected data entry error. Finally, where the four categories of services were not all recorded but those that were summed to 100%, the remaining categories were filled with zeroes to prevent missing values which would result in that observation not being included in the regression.

3. World Bank data series on total exports, total merchandise exports and total services exports (all in current US dollars) were then used to calculate percentages of merchandise and services exports in total exports. Unfortunately in several cases, these percentages summed to well over 100%. Often even the percentage of merchandise or services exports by itself summed to well over 100%. To deal with this problem all shares over 100% were changed to 99.9999%. Then if the sum of the percentages of merchandise and service exports was still over 120%, the observation was deleted from the dataset. The cut-off of 120% was chosen to allow a 10% margin of error in each category and to try to strike a balance between the need for a reasonable degree of accuracy in export data, without culling too many observations.

Observations culled were: Argentina 1980-84; Botswana 1999; Dominican Republic 1980, 1983-2000; El Salvador 1987-1982, 1992; Ethiopia 1991-92; Ghana 1980-1982; Guinea-Bissau 1982-85, 1989-93, 1996; Jamaica 1996; Mozambique 1996-1999; Nicaragua 1990, 1996-97; Peru 1986-89, 1991; Sierra Leone 1994; Somalia 1981, 1985; Suriname 1987, 1989-2000; Syria 1986, 1989-96; Togo 1994; Uganda 1981, 1994.

4. After corrected merchandise and service export percentages of total exports were created, these percentages were converted to shares and used to convert the raw World Bank data series given as a percentage of merchandise exports or services exports, to percentages of total exports.

Table A3.1: Descriptive Statistics of Non-Transformed Variables for Entire 84 Country Sample

Variable	*Description*	*Obs*	*Mean*	*Std. Dev.*	*Min.*	*Max.*
	Economic Variables (included in every regression)					
LGDPPERC99	Log GDP per capita	390	7.092247	1.301289	4.50557	10.60734
LAGM2	Lagged M2	389	34.73573	25.41182	4.54495	162.5003
KFORM	Capital Formation (% GDP)	388	20.60309	7.017407	4.71712	46.58228
FDI	Foreign Direct Investment (% GDP)	370	1.512673	2.22426	-4.95894	12.56345
INFLN	Inflation (%)	362	39.68579	150.1245	-3.97302	1617.242
BUDGBAL	Budget Balance (% GDP)	288	-3.534945	5.081064	-25.35142	16.96233
EXPCGDP	Exports (% GDP)	394	32.28495	27.05948	0.5703	195.3252
IMTAX	Import Taxes (% GDP)	280	14.00999	9.403558	0.27181	54.08476
	Institutional and Political Variables (included in every regression)					
RULE	Rule of Law (6 is best)	412	2.920328	1.274472	0.1	6
BURQ	Quality of Bureaucracy (6 is best)	412	2.66432	1.108811	0.5	5.5
CORR	Corruption (6 is best)	412	2.787945	1.107327	0	6
ETHTENS	Ethnic Tension (6 is best)	412	3.541019	1.499977	0	6
	Economic Variable of Interest (included in some regressions)					
GDPPERCG	GDP *per capita* Growth (%)	402	0.7338693	3.48668	-11.80209	10.39358
EXCONC	Ex. Concentration (1=most conc.)	318	0.3986509	0.2140417	0.07085	0.97418
TOTVOL	Terms of Trade Volatility	399	10.53891	7.775345	0.70381	40.00766
DTOT	Change in Terms of Trade	401	-1.925819	8.026778	-45.23724	24.4588
PPEXVOL	Purchasing Power of Exports Volatility	403	19.90341	24.85935	0.85124	371.5324
	Shares of Total Exports by Category (% of total exports)					
AGRAWEX	Agricultural Raw Materials	307	5.277879	9.093705	0.00173	81.41974
FOODEX	Food	307	21.40439	20.4459	0.11129	95.26184
FUELEX	Fuel	300	16.42185	27.6228	0	99.02828
MANFEX	Manufactures	308	24.51939	23.00516	0.02908	83.82178
METALEX	Metals	305	7.262524	13.79221	0.00535	83.2388
COMSVEX	Communications & Computer Services	337	7.73259	6.122228	0	43.89
INFINSVEX	Insurance & Financial Services	337	0.500705	0.6918602	0	4.74852
TRANSVEX	Transport Services	337	5.843446	5.888873	0	34.74098
TRAVSVEX	Travel Services	337	7.770117	8.04823	0	40.73225
	Poverty Indicators					
INFMORT	Infant Mortality	420	65.5297	42.74402	3.425	192.6
U5MORT	Under-5 Mortality	224	102.923	75.47612	5.85	335
IMMMEAS	Immunisation Against Measles	373	63.41131	25.06957	1	99.22
IMMDPT	Immunisation Against DPT	377	63.28747	25.69394	1	99.33
FEMILLITA	Female Adult Illiteracy	390	40.43781	26.27122	2.01675	96.7565
FEMILLITY	Female Youth Illiteracy	390	25.11942	24.60228	0.2	93.7875
MALNUTH	Malnutrition by Height	171	29.49859	14.86034	1.95	67.7
MALNUTW	Malnutrition by Weight	178	21.43727	14.70428	0.8	70.9
LOWBWBS	Low Birth-Weight Babies	215	11.77326	6.849137	2	50
SSCEN	Secondary School Enrolments	134	41.72549	23.92831	3.25702	96.94058

Appendix 4: Basic specifications for Redding's (1999) model

Redding employs a standard Ricardian model of international trade, with two economies, home and foreign (with foreign variables denoted with an asterisk: *), perfect competition and constant returns to scale – augmented with a specification for productivity dynamics.

- There are two goods:
  z = a low-technology, traditional good, such as agriculture and textiles, and
  h = a high-technology, frontier good, such as manufacturing, electronics
- Labour, **L**, is the sole factor of production
- The two economies are populated by a number of representative consumers, **N** and **N***
- Time is continuous and indexed by **t**
- Consumer preferences are identical in both countries
- Instantaneous utility is a Cobb-Douglas function of consumption of the low and high-tech goods:

$$\mathbf{u(c_z,c_h) = c_z^{\beta} c_h^{1-\beta} \text{ where } 0 < \beta < 1}$$

- Intertemporal utility is the sum (integral) of instantaneous utilities, discounted at the subjective rate of time preference, ρ.
- There is no storage or saving so at each point expenditure equals income.
- Each consumer is endowed with one unit of labour which is supplied inelastically with zero disutility.
- The goods z and j are produced with constant return to scale technologies.
- $\mathbf{A_j}$ = productivity in each sector (where j = z, h), which depends on: $\mathbf{K_j}$
- Aggregate output in each sector is therefore: $\mathbf{Y_z = A_z L_z}$ and $\mathbf{Y_h = A_h L_h}$
- Production occurs under perfect competition.
- Labour is perfectly mobile between sectors and immobile across countries.
- Home labour market clearing requires: $\mathbf{L_z + L_h = N}$
- Productivity $\mathbf{A_j}$ depends on $\mathbf{K_j}$, where $\mathbf{K_j}$ = a stock of sector-specific production experience (past learning by doing), which evolves according to:

$$\mathbf{K_z(t) = \mu_z L_z(t) K_z(t)} \qquad \mu_z > 0$$

$$\mathbf{K_h(t) = \mu_h L_h(t) K_h(t)} \qquad \mu_h > 0$$

Where μ_j parameterises the *rate* at which knowledge is acquired in producing good j.

- Productivity $\mathbf{A_j}$ also depends on exogenous factors such as climate, culture, political institutions, laws etc, grouped together here as: ψ_j where $\psi_j > 0$ for j = z, h.

So we have: $\mathbf{A_z(t) = \psi_z K_z(t)}$ and $\mathbf{A_h(t) = \psi_h K_h(t)}$ which just say that productivity in each sector depends on exogenous factors and on sector specific production experience.

Assuming free trade and zero transport costs, a country will have a static comparative advantage at time t, if the opportunity cost (measured in terms of relative productivities) of producing the low tech good, z, compared with the high-tech good at home is *lower* than in the foreign economy, i.e. if:

$$\mathbf{A_h(t)/A_z(t) < A_h^*(t)/A_z^*(t)}$$

Under autarky, there is incomplete specialisation and labour is allocated in the constant proportions β and 1-β to the low and high-tech sectors respectively, so: $\mathbf{L_z = \beta N}$ and $\mathbf{L_h = (1-\beta)N}$. Home then accumulates production experience at the rates $\mathbf{g^n_z = \mu_z \beta N}$ and $\mathbf{g^n_h = \mu_h (1-\beta) N}$. With free trade,

home will completely specialise in z and the foreign country will completely specialise in h. So from then on, due to reallocation of resources (labour), home learns by doing and improves productivity only in z (at the rate: $\mathbf{g^f_z = \mu_z N}$), and the foreign country learns by doing only in h (at the rate: $\mathbf{g^{f*}_h = \mu^*_h N^*}$).[76]

Redding next considers intertemporal welfare under various regimes, which is given by the discounted sum of the intertemporal utilities. The specialisation according to comparative advantage under free trade led to reallocations of resources between the low- and high-tech sectors. These reallocations in turn affect rates of learning by doing and productivity growth in each sector of the two economies, and hence they have dynamic effects on economic welfare.[77]

Intertemporal welfare depends not only on levels of instantaneous utility following resource allocation according to static comparative advantage, but also on the *rate of growth* of instantaneous utility after time t_1. Under free trade then, there are three important dynamic effects:
1. The rate of learning increases in the low-tech sector as a result of specialisation (from $\mathbf{g^n_z = \mu_z \beta N}$ to $\mathbf{g^f_z = \mu_z N}$)
2. Home learning in the high-tech sector drops to zero as a result of specialisation (from $\mathbf{g^n_h = \mu_h (1-\beta) N}$ to $\mathbf{g^f_h} = 0$)
3. Home benefits from foreign learning in the high tech sector (from $\mathbf{g^{n*}_h = \mu^*_h (1-\beta) N^*}$ to $\mathbf{g^{f*}_h = \mu^*_h N^*}$).[78]

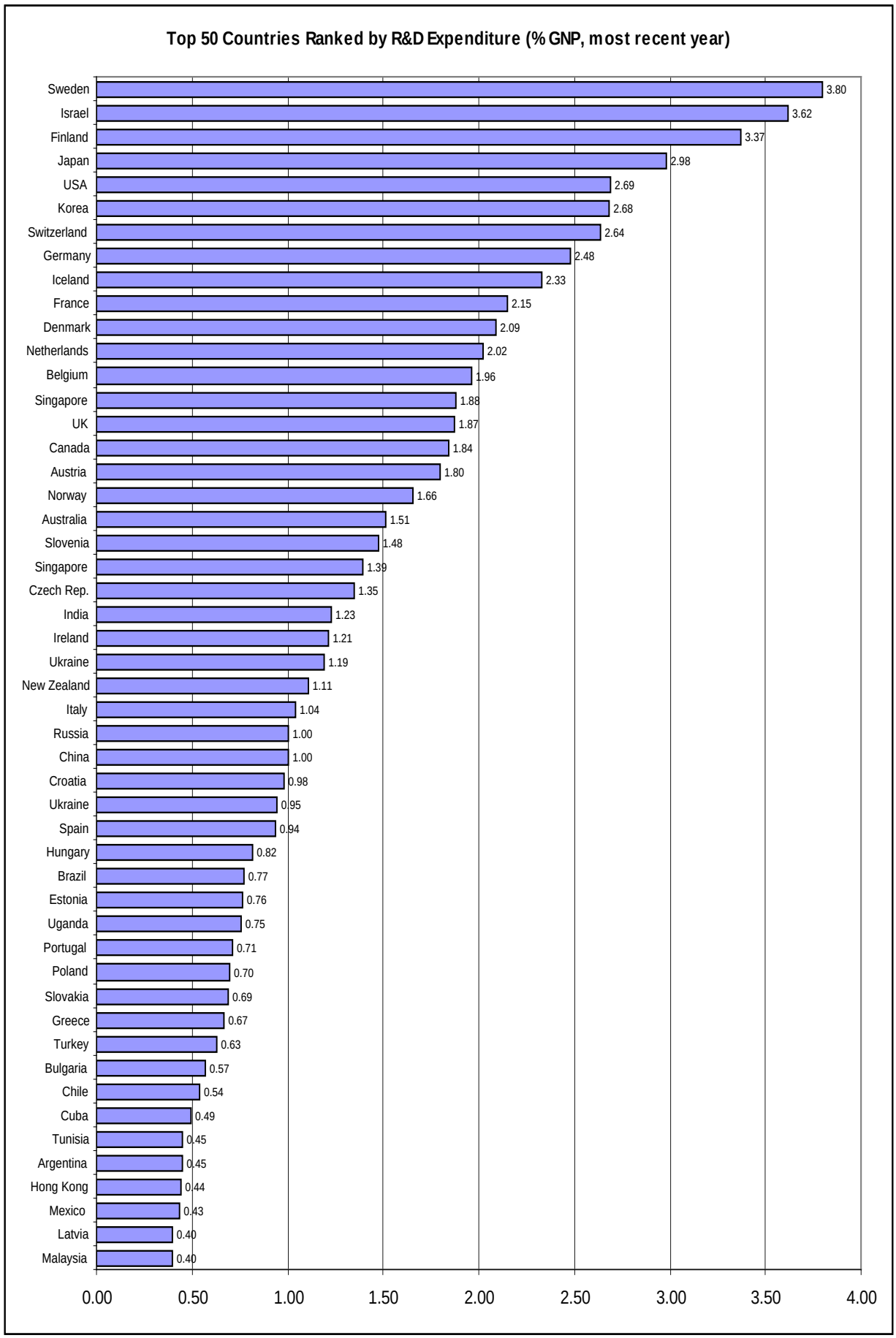
The net effect on intertemporal welfare depends on the net result of these three effects. The first effect is unambiguously positive. However, the net effect of the second and third effects, depend on the relative rates of learning in the high tech sector under autarky in the home country ($\mathbf{g^n_h = \mu_h (1-\beta) N}$) and under free trade in the foreign economy ($\mathbf{g^{f*}_h = \mu^*_h N^*}$) . These rates of learning depend on the size of each economy (measured by **N** and **N***) and by the potential for learning and productivity growth in each (determined by μ_h and μ_h^*).

[76] Redding 19-22. Superscript **n** = no trade (autarky), and superscript **f** = free trade.
[77] Redding (1999), p. 23.
[78] Redding 19-22. Superscript **n** = no trade (autarky), and superscript **f** = free trade.

Appendix 5: Research and Development Rankings

The following table uses the most recent available data for each country from UNESCO. *Researchers* are defined as professionals engaged in the conception or creation of new knowledge, products, processes, methods and systems, and in the planning and management of R&D projects. Post-graduate students engaged in R&D are considered as researchers.

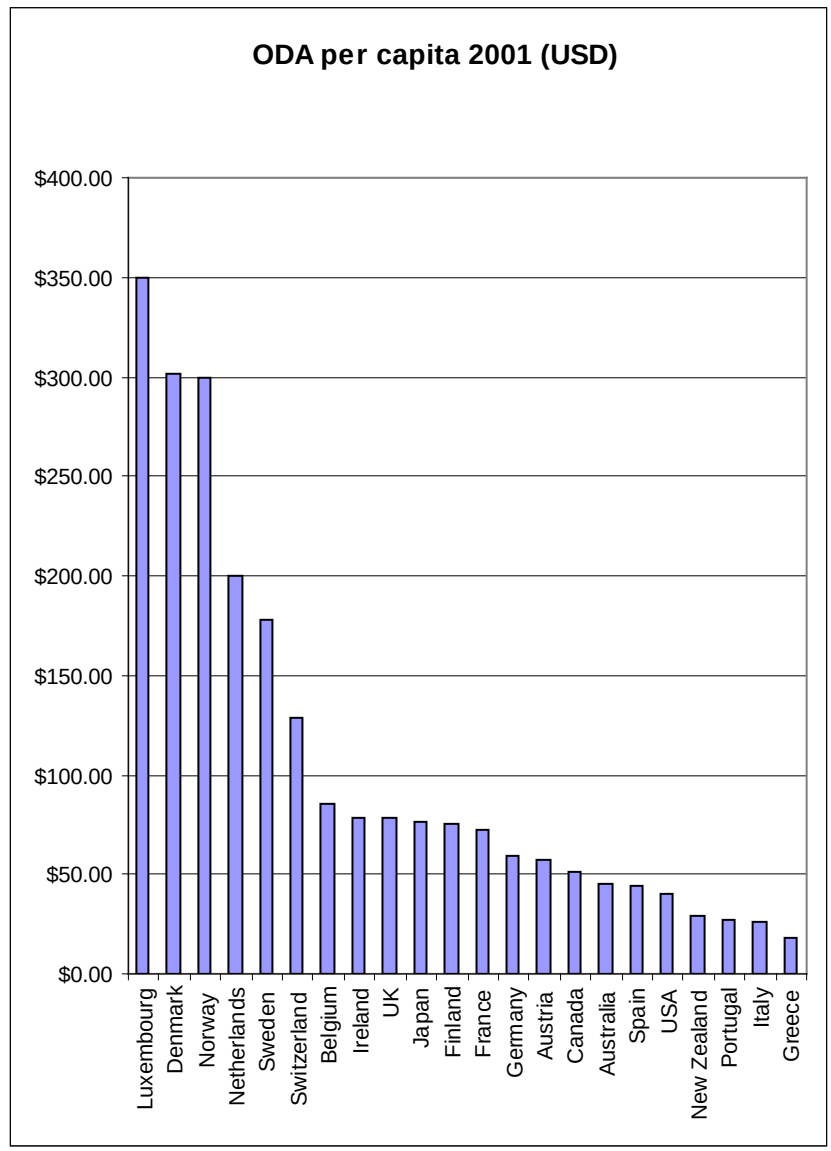
Rank	Country	Data Year	R&D Exp (% GNP)	Researchers per million inhabitants
1	Sweden	1999	3.80	4,511
2	Israel	1999	3.62	
3	Finland	2000	3.37	5,059
4	Japan	2000	2.98	5,095
5	USA	2000	2.69	
6	Korea	2000	2.68	2,319
7	Switzerland	2000	2.64	3,592
8	Germany	2000	2.48	3,161
9	Iceland	1999	2.33	5,695
10	France	2000	2.15	
11	Denmark	1999	2.09	3,476
12	Netherlands	1999	2.02	2,572
13	Belgium	1999	1.96	2,953
14	Singapore	2000	1.88	4,140
15	UK	1999	1.87	
16	Canada	2000	1.84	
17	Austria	2000	1.80	
18	Norway	1997	1.66	3,979
19	Australia	1998	1.51	3,353
20	Slovenia	1998	1.48	2,149
21	Singapore	1996	1.39	2,699
22	Czech Rep.	2000	1.35	1,349
23	India	1996	1.23	157
24	Ireland	1999	1.21	2,184
25	Ukraine	1997	1.19	2,200
26	New Zealand	1997	1.11	2,197
27	Italy	1999	1.04	1,128
28	China	2000	1.00	545
29	Russia	2000	1.00	3,481
30	Croatia	1999	0.98	1,187
31	Ukraine	2000	0.95	2,118
32	Spain	2000	0.94	1,921
33	Hungary	2000	0.82	1,445
34	Brazil	2000	0.77	323
35	Estonia	1999	0.76	2,128
36	Uganda	1999	0.75	22
37	Portugal	2000	0.71	
38	Poland	2000	0.70	1,429
39	Slovakia	2000	0.69	1,844
40	Greece	1999	0.67	1,400
41	Turkey	1999	0.63	306
42	Bulgaria	1996	0.57	1,746
43	Chile	2000	0.54	370
44	Cuba	2000	0.49	480
45	Tunisia	2000	0.45	
46	Argentina	2000	0.45	713
47	Hong Kong	1998	0.44	
48	Mexico	1999	0.43	225
49	Latvia	1999	0.40	1,078
50	Malaysia	1998	0.40	160
51	Romania	2000	0.37	913
52	Panama	1999	0.35	124
53	Venezuela	2000	0.34	194
54	Georgia	1999	0.33	2,421
55	Kazakhstan	1997	0.29	716
56	Bolivia	2000	0.29	98
57	Mauritius	1997	0.28	
58	Uruguay	1999	0.26	219
59	Colombia	2000	0.25	101
60	Cyprus	1999	0.25	358
61	Azerbaijan	1996	0.24	2,791
62	Costa Rica	1998	0.20	
63	Kuwait	1997	0.20	223
64	Egypt	2000	0.19	
65	Kyrgyzstan	1997	0.19	581
66	Burkina Faso	1997	0.19	16
67	Sri Lanka	1996	0.18	191
68	Syria	1997	0.18	29
69	Nicaragua	1997	0.15	73
70	Trinidad and Tobago	1997	0.14	145
71	Thailand	1997	0.10	74
72	Ecuador	1998	0.09	83
73	Peru	1999	0.08	
74	Senegal	1997	0.01	2


Top 50 Countries Ranked by R&D Expenditure (% GNP, most recent year)
Sweden 3.80
Israel 3.62
Finland 3.37
Japan 2.98
USA 2.69
Korea 2.68
Switzerland 2.64
Germany 2.48
Iceland 2.33
France 2.15
Denmark 2.09
Netherlands 2.02
Belgium 1.96
Singapore 1.88
UK 1.87
Canada 1.84
Austria 1.80
Norway 1.66
Australia 1.51
Slovenia 1.48
Singapore 1.39
Czech Rep. 1.35
India 1.23
Ireland 1.21
Ukraine 1.19
New Zealand 1.11
Italy 1.04
Russia 1.00
China 1.00
Croatia 0.98
Ukraine 0.95
Spain 0.94
Hungary 0.82
Brazil 0.77
Estonia 0.76
Uganda 0.75
Portugal 0.71
Poland 0.70
Slovakia 0.69
Greece 0.67
Turkey 0.63
Bulgaria 0.57
Chile 0.54
Cuba 0.49
Tunisia 0.45
Argentina 0.45
Hong Kong 0.44
Mexico 0.43
Latvia 0.40
Malaysia 0.40
0.00 0.50 1.00 1.50 2.00 2.50 3.00 3.50 4.00

Appendix 6: Official Development Assistance Per Capita in 2001

Sources:
OECD in Figures 2002: Statistics on the Member Countries, OECD, Paris.
OECD Aid Figures 2001:
http://www.oecd.org/EN/document/0,,EN-document-15-nodirectorate-no-12-29438-15,00.html
Note: Figures are approximate because population data is from 2000 but ODA data is from 2001.

Rank	Country	Approx. ODA per Capita in 2001 (USD per person)
1	Luxembourg	$350.00
2	Norway	$301.89
3	Denmark	$300.00
4	Netherlands	$200.00
5	Sweden	$177.53
6	Switzerland	$128.17
7	Belgium	$85.29
8	UK	$78.38
9	Ireland	$78.32
10	Japan	$76.40
11	Finland	$75.00
12	France	$72.59
13	Germany	$59.44
14	Austria	$56.79
15	Canada	$51.48
16	Australia	$44.74
17	Spain	$44.42
18	USA	$39.87
19	New Zealand	$28.95
20	Portugal	$27.00
21	Italy	$26.09
22	Greece	$18.10



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